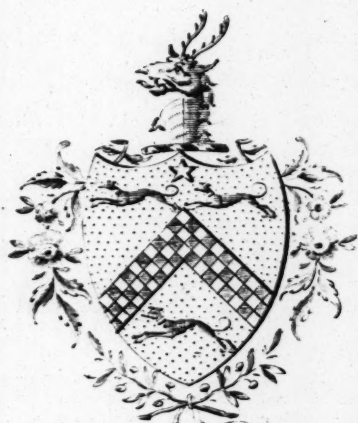


*Francis Douce.*



*Francis Douce.*

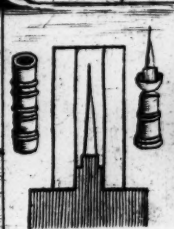




T. Crank Invent



A RICH  
CABINET  
WITH  
Variety of Inventions  
in several Arts  
and Sciences  
By J. W.  
London  
Printed for W. Whitwood  
1677.



Douce  
W 740

2/4  
A R I C H  
C A B I N E T,

WITH  
Variety of Inventions :



Unlock'd and open'd, for the Recreation of  
Ingenious Spirits at their vacant hours.

Being Receipts and Conceits of several Na-  
tures, and fit for those who are lovers of Na-  
tural and Artificial Conclusions.

A S A L S O  
Variety of Recreative Fire-works both for *Land* ,  
*Air*, and *Water*. And Fire-works of Ser-  
vice for Sea and Shore.

Whereunto is added divers Experiments in *Drawing*,  
*Painting*, *Arithmetick*, *Geometry*, *Astronomy*, and  
other parts of the Mathematicks.

Likewise Directions for Ringing the most usual  
Peals, that belong to that Art.

---

Collected by J. W. a lover of Artificial Conclusions.

---

The Fifth Edition, with many Additions.

---

L O N D O N,  
Printed for William Whitwood at the sign of the  
Golden Bell in Duck-Lane near Smith-field.  
1677.

19

THE  
CARRIAGE

WITH

THEORY OF INVENTIONS  
AND THE HISTORY OF THE  
ART OF CONSTRUCTION  
AND THE HISTORY OF THE  
ART OF CONSTRUCTION

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AND THE HISTORY OF THE  
ART OF CONSTRUCTION

TO  
ALL LOVERS  
of Ingenious and Arti-  
ficial Conclusions.

**C**ourteous Reader, (you know and I know,  
that) the wits of this age are acute and  
various, therefore how to please all mens  
fancies, is a Task too ponderous for my undertak-  
ing. I have unlock'd and open'd to your view a  
rich Cabinet of varieties; if there be any thing  
therein contained that may yield you profit, solace  
of the mind, recreation of the spirits, or content,  
I shall think my labour well bestowed, and be  
glad; If it be otherwise, I shall be sorry that I have  
nothing therein to please your mind, intreating  
you to shut down the lid again, and then I hope  
there is no hurt done.

This may be compared to a Garden composed of  
sundry varieties, wherein you may pick and cull  
out those Flowers that best please you, and are  
fittest for your pleasure or profit: For the laborious



## The Epistle.

Bee gathereth her cordial Honey, and the venomous Spider her corroding poison (many times) from the same Flower. And I know that there are some envious Criticks that will snarle at me for publishing many things contained herein ; But I care the less, because I aim at the publick (and not my own private ) good ; and no man ( I think ) should be born only to himself, and hide his Talent : And therefore these few Receipts which I have Collected, with divers of mine own (gentle Reader ) I dedicate freely to thy use ; Knowing that Art imitating Nature, glories alwayes in in the variety of things which she produceth, to satisfy the minds of curious Inquisitors of Natural and Artificial Conclusions. Therefore I doubt not but there are many things contained in this small Volume, that will give satisfaction to the Ingenious for whose sakes I have compiled it : So taking leave, I will ever remain,

An Artists Friend,

JOHN WHITE.

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## The



## A rich Cabinet with variety of Inventions.

### RECEIPT I.

*How to make a glorious light with a Candle, like  
the Sun-shine.*



His is a rare Conceit, and fit for those  
Artists, or others that perform curi-  
ous and fine works by Candle-light,  
as Jewellers, Ingravers, or the like,  
or those which are weak-sighted to  
read by, never dazeling the eye.

Go to the Glasse-house, or Glasse-shop, and let  
them blow you a thin round Globe-glasse, bigger  
than a penny Loof, (the bigger the better) with a  
short neck like a Bottle, they know how to make  
them. When you have this Glasse, with Glew or  
Wax binde a piece of Tape or Pack-thread about  
the neck or top, making a little loop there with to  
hang by; then fill your Glasse with the purest Con-  
duit or spring-water you can get (putting some A-  
qua-vitæ therein to keep it from freezing) stopping  
it close, to keep the dust out; having thus done, if  
you will use it at a Table or Bench, knock a Tenter-  
hook or Naile into the Seeling or Shelf, and with a

B

Tape



Tape or Pack-thread fasten it to the loop, and hang it up ; (but a round stick were better to hang it on, putting it into a post or hole in the wall, that you may let it higher or lower at your pleasure in turning the stick :) then behind your Glass set a Candle lighted upon the Table, and you shall have a glorious light through the Glass and water for your purpose ; behold the figure following.



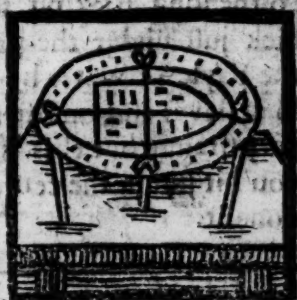
Some use to place a sheet of oiled paper betwixt them and a candle, and this will cause a good light.

## RECEIPT II.

*How (f. r a Wager) to cleave a thin Groat, or other piece of Silver in sunder, like two Groats.*

**T**HIS to many will seem impossible, yet may thus be done. Take three small pins, and prick them down upon a board, or table triangular-wise, and then take a thin whole Groat, and lay it level on the heads of the three Pins, as you see in this same Figure ; having thus done, take a piece of Brimstone and

and bruise or beat it to powder, covering the Groat therewith, all over, in a pretty thicknesse, and then with a lighted piece of paper, or a candle, set the Brimstone on fire until it be consumed; when this is done, and the fire out, you shall see the edges to open a little like a dry Oyster, then take a Knife and put into it, and it will easily cleave in sunder, having the impression on both sides very perfect.



### RECEIPT III.

*To lay one end of a staffe or stick upon a stool, or table, and to hang a Pail full of water at the other end, having nothing to hold on the stick, nor nothing under the Paile.*

**T**O perform this conceit, doe thus, Lay one end of a Staffe or Stick a pretty way upon a table or Stool (so that it roule not off) letting the other end hang over the table likewise, (as you may see in this Figure here expressed) then take a Pail full of water, and hang the payle or handle upon the same; but you must have another short stick that will reach just from the inside of the bottom of the pail,



to the long stick on the table, placing the short stick just under the payle very stiffe, and then shall the Payle of water hang from the ground upon the long staves end on the table without falling, seeming very strange, but this is something difficult at first, till you hit just in the center of gravity: yet I have often done it.

# RECEIPT IV.

*How to make dainty sport with a Cat.*

**I**F you will have some sport with a Cat, then get a little Bell, such as the tame Hawks have at their legs, and tye the Bell something hard at the end of the Cats tayle and let her go, she feeling of her tayle smart, and hearing of the Bell gingle, she will run up and down as if she were mad, flying against the walls and windows: then if she can, she will get into some hole to hide her self, but when she wags her tayle never so little, then out she comes, and is as mad as before, and never will rest in quiet till it be taken off, or she can get it off her self.

*Another.*

Some have shod a cat round, with putting melted Pitch into four Walnut-shells, and placing her feet therein, and she will make pretty sport.

*Another.*

I was told of a merry Fellow that came into an Ale-house in cold weather, and finding but a reasonable Fire, said, He would make the Cat pisse it out, and, watching his opportunity, he getteth his Hostesses Cat, putting her head betwixt his thighs,

and

and holding her four feet fast in one hand, and with the other hand held up her tayle near the fire, and did pisse such abundance that she quite quenched the same.

---

RECEIPT V.

*How to make very pretty sport with Ducks, or Poultry.*

**O**Ne Summers day my self and two or three Friends, walked into the Fields for our recreation, and being dry and hungry, we went to a Visualling-house in a Country Village, where we could get nothing to eat but Bread and cheefe, and sitting in an Arbour, the Womans Ducks being near us we flung them our parings of cheefe, the Ducks were very greedy of the same, ( then quoth one of our Company ) I will shew you some sport.

Presently he getteth about a yard of strong threed, and finding a little rag of red cloath, tyeth it to one end of the threed, and at the other end tyeth a piece of Cheefe ( somewhat lesser then a Bean ) with part of the rind on : and throweth it amongst the parings to the Fowle, presently one of them swalloweth it down, now the rest of the threed and the Rag dragged behind her, and she wadling up and down, perceived the red Rag to follow her, of which she was sore afraid, then she did run from place to place, not knownig what to doe, at length she took wing and flew into a Pond of water, and there she quackt, but presently she spy'd the rag to swim after her, then down she dived, then up a-



gain, then down, then up, at length out of the Pond again in her former posture, at which the Woman was amazed, and thought her Duck was bewitched. But at the length the threed was tangled at some bush or other, and so broke, or pulled the Cheese out of her belly, and then she was quier.

The likesport you may have with other Poultry, by tying a long white Goose-quil, ( or a light stick with a rag on the top ) upright at her tayle.

#### RECEIPT VI.

*How to have pretty sport at Cock-fighting with a single Cock.*

**T**AKE a pretty big Looking-glass, and set it against a wall on the ground in any Room or other place ( not full upright, ) tying the string of the Glass with a nail to keep it from falling: then put a Cock into the room, and throw some crums near the Glass, and when he seeth his picture therein, you shall have dainty sport with him, for he will fight vehemently with his own shadow, supposing there is another Cock, for as he moves, so doth his shadow, some times with his motion he loseth it, and then he will look behind the Glass for the other Cock, and not finding him, he will clap his wings and crow, as though he had got the victory, but spying it again he wil begin a fresh battle.

If you please, you may hold the Glass in your hand moving it up and down, and he will doe the like.



*with variety of Inventions.*

RECEIPT VII.

*How to know the hour of the day or night at any time,  
by a Ring and a Glass, being a dainty clock.*

**T**AKE a small Thread, and put it through a Gold Ring, or other like Ring, and doubling the Thread, tye a pretty big knot at the end, and cut it off, and let the doubled Thread be seven or eight inches long, then take a Bolc-glass, and set it off a Table, and hold the knot of the thread something hard betwixt the ends of your forefinger and your thumb, as you see here in the figure, which will cause the Pulse of your wrist to beat; let the ring hang in the middle of the glass a little within the rim, then the working of your Pulse will make the Ring to move striking upon the sides of the Glass the hour of the day or night, and then the Ring will stand still again.



## RECEIPT VIII.

*Another excellent Rule, to know the hour of the Day or Night at any time.*

**I**F any two (or more) Parties be in company together, let one of them take something from the ground, (what they please) and give it to another Party standing by.

Now, if the thing taken up hath grown, and may grow again, as Seeds, Hearbs, or the like, it is then 1. 4. 7. or 10. of the Clock, or very near.

If it did never grow, nor never shall, as Stones, Metals, Pot-sheards, Glass or the like, it is then 2. 5. 8. or 11. of the Clock, or very near.

But if it hath grown, and will never grow again, as Sticks, Chips, Shels, or such like, it is then 3. 6. 9. or 12. of the clock, or very near.

*But remember this Caution.*

That both they that give the judgement, and they that take up the thing, do not know what hour it is before they try the Conceit.

RE

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RECEIPT IX.

*How to spit three Capons upon one spit at once, and to have an equal fire at each of them, yet one shall be quite raw, the other be well boyled, and the third thoroughly roasted.*

**I** Have heard that this Conceit was performed by a Noble-mans Cook upon a Wager, and thus he did it. To tend the first Capon he had a Boy that continually basted and poured cold water on the same, and so kept it raw.

To the second, he had another like attendant to baste, and pour continually seething and scalding water, and that was well boyled.

The third he tended himself, basting it with Butter, and that was thorowly roasted, and so he won the wager.

---

RECEIPT X.

*How to make two Knives (with a short stick) to hang upon the brim of a glass without falling.*

**T**AKE a little stick, some foure inches long, and make it sharp at one end like a Butchers Scuer, and then get two Knives, somewhat of an equall poise, and prick the points of them towards the bigger end of the stick on each side slope-wise, as  
yo



you may see here in the Figure; then put the small end of the stick upon the rim of a Glasse of wine or beer, & you may take up the Glasse and drink, and they will not fall off.

# RECEIPT XI.

*A speedy way how to make a Horse fat, plump, and lusty.*

**T**AKE Cummin-seed, Annis-seed, *Enula-campana*, and *Turmerick*, a penny-worth of each, steepe them well with three heads of Garlick in a Gallon of Ale, then strain it, and presse out as much of the substance as you can, well wring out and give it your Horse to drink bloud-warm, a full quart at once, then ride him till he be hot, then afterward stable him, curry and litter him well until he be cold, doe this two or three mornings together, and then turn him to grass, & he will thrive wonderfully in a short time: if there were a handfull of *Groundsell* sodden with the afore-said ingredients, it would doe well.

Now if you will not put him to Grass, but keep him in the Stable, give him to eat with his Proven-der some of the roots of *Enula-campana*, with some *Cummin-seeds* beaten together, or the *Enula-campana*

*with variety of Inventions,*

III

Shred small, for fourteen dayes together, this will make a lean Horse to thrive, and grow fat in one moneth more than he would otherwise have done in a quarter of a year.

---

RECEIPT XII.

*How to keep a Horse from tiring by the way, and so make him foam at the Bit.*

**W**hen you are to ride, and fear that your Horse may tire, carry with you ( in some lethern Bag ) a good quantity of the powder of *Enula campana*, and when others do bait their Horses in their ordinary manner, your Horse being first well walked, rubbed, and littered, then give him a good handfull of your powder, in a quart of strong Ale or Beer, with a horn, tying his head high to the rack, and you need to give him no other provender, ( or very little ) till night, then let him be well meated, & give him in the morning two pennyworth of bread, and his Ale and powder, but remember to water at night.



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RECEIPT XIII.

*How one may put his finger, or wash his hands in melted Lead, without danger, or burning.*

**T**ake an ounce of Quick-silver, two ounces of good Bole-armoniack, half an ounce of Camphire, and two ounces of Aqua-vitæ, then mingle them



them together, and put them into a brazen Morter, and beat them with a Pestle: having thus done, annoint your hands all over throughly well with this oyntment, and then you may put your finger into melted Lead, or you may wash your hands therewith, if one pour the Lead upon them, and it will neither scald nor burn you.

### RECEIPT XIV.

*A very pretty and ready way to teach Children or others suddenly to learn their A B C. in manner of play.*

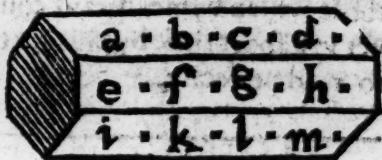
**C**Ause four pieces of Bone or Wood to be cut into six square like Dice, & upon every side or square let one of the letters of the Alphabet be ingraven or writ, as, A. B. C. D. E. F. upon one of them, then G H I K L M on the other, and so of the rest in order, as you may see here in the Figure.

Now the Child taking delight, and using to play with them (amongst other Children) and being told what Letters are uppermost, will soon learn their Alphabet, as it were by the way of sport and pastime.



Also, you may cause one piece of bone or wood to be made into six long square sides, about an inch and a half of length, and let each side be ingraven, or written with four Letters as a. b. c. d. and so of the rest of the sides, and let them throw

throw it, and name those Letters which are uppermost; and when they have learned the great Letters, you may write the small Letters on, as it is here on the Figure.



# RECEIPT XV.

*An excellent way to teach one to read speedily and truly, that before could not distinguish their Syllables.*

**L**ET a Scholar or one that can read well, take any Book of small value, and at every Syllables end underneath or at the top, with a small Pen of Ink, let them make a little speck or mark: but if the speck or mark were made with red Ink it were the better; Or if it be in a Book that you would not deface, then take a small Pin, or Needle, and prick little holes at each Syllable, which will hardly be perceived. This experiment is best to be made with hard words of many Syllables, as in the example following.

Abraham, Achitophel, Bartholomew,

Christopher, Demetrius Anabaptist,

Mathematician, Nebuchadnezar, Quo-

tidian, Patrimony, &c.

These

These to the ingenious will suffice, for I have known those which by no means could be brought to read, yet in a short time by this method they have learned to read perfectly.

# RECEIPT XVI.

*Of divers rare and dainty conceited motions, performed by the operation of the Magnet, or Load-stone.*

**M**Any and wonderful Mathematical conclusions are performed by the Magnet, or Load-stone, only I will give a touch at some few for recreation.

These stones are to be had at the Iron-mongers, but they ought to be polished and made fit by a cunning Artist. This stone hath his two Poles, one North the other South, answerable to the Poles of the world. For if you take a piece of Wyre of 4 or 5 Inches long, and touch one end thereof with a Load-stone, and then thrust it through a piece of Cork, putting it to swim in a Basin of water, presently you shall see one end of the Wyre will turn full North, and the other full South.

This receipt is profitable for some Travellers, who having a Sewing-needle about them that is touched with this stone, may prick it in some little light piece of wood or Cork, and place it in the water, and it will set out the North and South instead of a Compass.

If for recreation you take two Wyres, & put each Wyre into a Cork, touch one Wyres end with the North end of the stone, and the other Wyres end with

with a Frame of the stone, and then put them both in a quailon of water a pretty way asunder, yet they will begin to move and stir, and draw nearer together, and on the suddain joyn and meet : Now if upon those Wyres or Corks there were placed little paper Tilters on Horse-back, they would run their course at one another in the water very prettily.

Also, if this stone or Mignet, be inclosed in a box of Wood, Stone, Silver, or Brass, yet it will extend its operation and working by many pretty and ingenious practices admirable to behold.

As for Example, if you will make the forms and pourtraitures of divers things in thin Past-board, as Horse-men, Foot-men, Ships, Boats, Beasts, Birds, Flies, Wormes, Serpents, or the like, you may closely convey into them a short piece of Wyre, and set them upon a Board, Trencher, or Pastboard, and if you will have them move or walk, then held the Load-stone close in your hand, under the Board, and that way which you move your hand underneath, that way the images will move and creep on the top.

Also, if you place the Load-stone privately to, or near the Seeling, or over a Door, and then hold a piece of Iron near to it (tying a threed to the Iron) that it touch not the stone, which will attract it, and then the Iron will seem to hang in the Ayre. If you touch an Iron Ring with this stone, it will take up a dozen or more rings together, hanging one to the other like a chain. Also, if a knives point be touched therewith, it will take up Needles or wyre, and by it you may know the counterfeir, or New-gate halfe-penny, as some call them.

Many

Many other rare conclusions may I have learned by this stone, which I forbear to write. Fire, Garlick, or Onions, spoyleth the vertue of this stone; therefore let it not touch or come near them.

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### RECEIPT XVII.

*The making of the Thermometer, or Weather-Glass, whereby you may certainly fore-tell the alteration and change of the weather, a good many hours before it commeth to pass.*

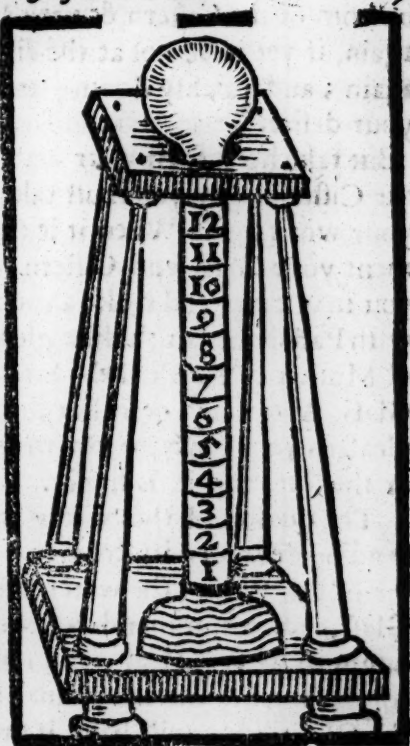
4 **T**HIS Weather-glass is compos'd of a quantity of Water and Air Artificially inclosed therein, the water being subject to a continual motion (either up-ward or down-ward) as the weather changeth: The Glasses you may have ready made at the Glass-shops, but be sure to chuse the longest and slenderest shanked Glasses, with a small head, for they are best. You must also have another Glass for a Cistern at the bottome to receive the water, the framing of it is thus.

Make a frame taper-wise of some fine light Deale or other wood, (only let the bottom board be somewhat thick and heaue to make it stand the steadier,) and let the head or uppermost board be lesser than the bottom, having a hole in the middle to put the glass through, as you may see in the Figure.

Your



Your Frame should be about a quarter of an inch longer than the shank of the glass because the lower end of the shank should almost reach to the bottom of the cistern: Now before you put in your Glass, you must divide the shank into certain degrees from 1 to 12 or more beginning from the rim of the Cistern, upward, placing figures thereon, having thus done, turn the head of your long glass downward and with a funnel fill it



almost full of water, then put the Cistern on the bottom board, and holding the frame sloping put the shank of the Glass ( through the hole at the head ) into the Cistern, and then set it upright. Now you must know at what degree to set your water, according to the season of the year: for if it be in Summer and very hot weather, then to set it at one or two degrees best, if the weather be temperate, then three or four, but in cold or frost set it at nine or ten. To this these degrees, (if your water be not low enough) you must pull up your Glass a very little way from the  
C bottom

bottom of the Cistern, & very suddenly put it down again, if yet it be not at the right degree, pull it up again; and quickly down (as before) till you have your desire.

But take heed, for if your water be fallen too low in the Cistern, then you must take them out, and begin your work again. When it is thus done, wax or cement your Glass and Cistern together, and then you may cover and make a rock about your Cistern, with Palt-board or the like, glewing or pasting pieces of Mother of Pearle shels, Smiths Cinders, pieces of Glass, Antimony, or other shining things what best pleaseth your fancy; or you may cover it with Mols, or the like, and it is finisht.

The quality of the water in this Glass is to ascend by degrees with cold, and to descend with heat; for in the Winter the water will be at the top of the Glass, and in Summer down to the rock. The water ought to be very clear, and coloured by Art, both for ornament, and the plainer to distinguish it from the Glass: If you will have it green, use Verdigrease, if yellow, use Saffron, or Turmerick, if red, use Brasse, or Turnsoile.

*The use and property of the Glass.*

By the uncertain motion of the water in this Glass it is a certain sign of fickle and unconstant weather, but contrarily, the continuance of the water at any one degree is a sure token that the weather will continue at that stay it is then at whether it be fair or foul, frost or snow. But when the water either riseth or falleth, the weather will then presently change: Also, the sudden falling of the water is a sure token of wet weather.

R E.

RECEIPT XVIII.

*A pretty way to catch Kites, Ravens, Crows, Magpies, or the like, alive.*

**G**Oe to the Apothecaries, and bestow two pence in *Nux vomica*, then beat them to powder, or slice it as you do Ginger, this being done, take raw Flesh or Liver, & cut it into little pieces or gobbets, that the Fowl may swallow them whole, then cut holes in the same, & put your powder or slices therein, and then lay these pieces where they haunt, but as soon as they have swallowed down the same, they will flye to the next high Tree they can come a t, and this presently makes them so drunk, or sick, that they streight will fall down from the top of the tree to the ground, that you may take them up alive with your hand: But you must be sure to watch them and run presently to the tree, for they will soon recover and flye away.

I believe if it were sodden with other Grain, it would have the like operation with other Fowl.

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RECEIPT XIX.

*A ready way to catch Pidgeons, or other Fowl.*

**T**AKE pieces of brown Paper &c, roul them round making Coffins of them, such as the Grocers make to put their fruit in; let them not be above a finger long, paste the sides and ends of them with some starch, clip the upper part of them round with a pair of Sheers, then anoint the inside of the uppermost skirts of them round about with Birdlime, or some stuff that will but cling to the Feathers: But

You must ( 2 day or two before you use it, ) lay or strew some Pease or other Grain to make them haunt the place and they will be the less fear-ful ; then if you please, make a hole in the ground a little way, and put your Coffins upright or sloping therein a few Peason or Corn in them, strewing here and there Peason near them, and when she picketh into the coffin she is immediately hooked, and blindfolded, not seeing which way to flye, and thus you may take them easily.

### RECEIPT XX.

*A merry Receipt, being a ready and sure way how to catch a Pick-pocket.*

**A**S I was writing the former Receipt, it put me in mind of a pretty conceit that a Friend once related to me, which was thus : A Gentleman being in a throng in a Fair, had his Purse pickt out of his pocket, he missing it was somewhat vext but could not mend it, but studied how (if he could) to be revenged : presently he buyeth two penny-worth of Fish-hooks, and causeth a Taylor to sew them round about toward the upper part of his pockets, with the points of them down-wards, and so the next day away he goes to the Fair again amongst the throng, throwing his Cloak on one shoulder, seeming careless of his pocket, wherein he had store of money : Presently there was a Diver nibbling at the bait, and nimbly had his hand in his pocket : The Gentleman being wary (perceived that the Fish had swallowed the hook) gives a jerk aside which caused the hooks

to

to catch good hold in his hand, and then he had him sure : Then said the Gentleman, Fellow, what maketh thy hand in my pocket ? O god Sir, (replied the pick-pocket) pardon me, I cannot pull it out. Come (saith the Gentleman softly to him, because no body should take notice) go along with me: So cheek by joll they walked together, with his hand fast in the pocket ( but covered with his Clo k ) and to the Tavern lovingly they go together, where the Gentleman told him of the loss he had sustained the day before , and making of him to restore back his money, he cut out his pocket, and let him goe. Surely this Pick-pocket had good store of picking work to get the hooks out of his hands again.

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### RECEIPT XXI.

*How to make Fowls and other small Birds drunk, that you may take them with your hands.*

**Y**OU must observe what meat they love or use to eat, as Wheat, Barley, or other Grain, and lay the same to steep in the Lees of Wine, or in *Aqua-vite*, or in the juyce of Hemlock, and strew the same Grain in the places where the Birds do haunt.

*Another.*

Take Tormentil and boyl it with strong Wine, Wheat, Barley, or other Grain, then strew this in those places where you intend to take them, or where they use to haunt, and the Birds will eat the pieces among the grain, wich will make them so drunk that they cannot flye away.



*Another.*

Make Past with Barley meal, Onion blades, and Henbane seeds, and put or throw it where the Birds doe haunt.

These experiments are best to be done in Winter in a deep Snow.

### RECEIPT XXII.

*A sly way to catch Fish in a dark night, with a Candle under Water.*

**G**Et an Urinal, and put pretty soft clay therein, and with something that is flat at the end presse the clay gently to the bottom of the glass, smoothing it as well as you can, then take a stick and shape it about the bigness of a Candles end, wet the stick, and put it into the neck of the glass, making a hole in the middle of the clay, as you make clay candle-sticks; then make a little hoop of a Willow stick, and tye pieces of cork in four places of the hoop equally distant, and get a thin light round piece of board, and with four little sticks of an equall length, tye one end of them to the Corks, and the other ends fasten to the board to support it, as you may see here in this Figure,

In

In the board you must make a hole in the middle to put the neck of the Glas through, & there tie it and make a loppe with a string to the board that you may with a long pole put it into the water: when you will use it, put your Candle into the glas in the clay socket, a little below the brim, that the



wind blow not, the light out. If you please, you may with Wax or Glew put little pieces of Looking-glasses, or other Glas under the board, on the side next the water, and this light will shine a great compassse in the water, and the Fish will streight resort to the same, where you may very easily take them with a Net.

This might be done with the Glas alone, by tying Corks about the neck of the Glas, to keep the mouth above water.

### RECEIPT XXIII.

*An excellent Bait to catch Fish with an Angle.*

**M**AKE Paste with fine Wheat-Flower, tempered with a little Saffron and Sugar, and bait your hook there-with, and they will bite apace. This is a good bait for Roch, Dace, and such like.

Another.

Take the crum of a new penny White-loaf and an ounce of *Coculus India*, and an ounce of Henbane seed finely powdered, temper the same well with good *Aqua-vitæ* into a Paste, and divide them into small pieces bigger than grains of wheat, and then cast handfulls in at once into the water where is store of Fish, and you shall presently see the operation of the same.

## RECEIPT XXIV.

*How to make one Watching candle, that it shall out-last three Watching candles.*

**T**AKE a Pail, or Bucket, and fill it full of water, and set it in the place where you intend that your light shall stand: then take your Candle and warm it at the lower end, and there stick a brass farthing token, or such like; and when you will light your Candle, put it gently down into the middle of the water, (but be sure that the bottom of the Candle do not touch the bottom of the Pail) and then it will swim upright to the very edge near the light. The reason that the Candle will last so long is caused by the coldness of the water; and this is a safe way that no Rat can run away with the Candle lighted, as I have heard that they have done; by endangering the house with fire.

RE-

## RECEIPT XXV.

*How to write any name or mark upon a Paper, and then burn it to ashes, yet afterward it may be read plainly.*

**T**AKE a new clean Pen that was never written withall, and dip in your own water as you do in Ink; then strip up your Shirt-sleeve above your wrist and upon your arm write your name, or any name or any mark, and then let it dry on your skin, and nothing will be seen, then put down your sleeve and button your wrist. (Do this privately, and it will cause some to wonder:) then take a piece of white paper, and write your name or the mark thereon, with another Pen of black Ink, (but let it be written as like the other as you can) then take the paper and burn it, and lay the ashes on a Table, and stripping up your sleeve, rub the ashes hard with your finger, where you had written with your wa-er, then blow off the ashes, and the name or mark will plainly be read on your arm in black letters.

## RECEIPT XXVI.

*How to see plainly any thing in a dark Room, in at a Door or Window, standing a great distance off.*

**I**F there be never so dark a Room, with a Door or Window open, Take a Looking-glass in your hand, and hold it against the Sun, at a great distance from the Door or Window, and moving the Glass up

up and down, till the reflection of the Sun be upon your object, and then you may perfectly behold any thing in the Room, or see to read a Letter.

Some unhappy boys use to dazle peoples eyes with a Glass in this order, as they walk the streets.

### RECEIPT XXVII.

*How to view the back part of your head by Glasses.*

**I**F you would behold the back part or shadow of your Head (for a wound, or the like) take a Looking-glass, & hold it behind your head, and then take another Looking-glass and hold it before you, and from the Glass behind, you may see your shadow in the Glass before you.

### RECEIPT XXVIII.

*A pretty trick to tell, or name all spots or court Cards in the Pack, and yet never see them.*

**Y**OU must privately drop a drop of water or drink (about the bigness of two-pence) on a table before you where you sit, and let any body shuffle the Pack of Cards, and then taking them into your hand place a candle on the table before you (for this trick is best to be done by candle-light) and holding down your head (as you may see in the Figure) lift the Cards above the brim of your Hat, close to your head, that the light of the Candle may shine on the Cards, then in the drop of water (like a Looking-glass) you shall see every speck of each Card before you draw them, which you may name; or putting your finger upon the



spots, you may say that you feel them out; then lay down your first Card, and name the next, as your first Card was the Deuce of Clubs, the next is the five of Spades, and so of the rest.



### RECEIPT XXIX.

*How to keep or preserve any Fowle, Venison, or other pieces of Flesh, sound and sweet for three weeks, or a moneth together; although the weather be never so hot.*

**M**ake a strong Brine with Bay Salt and white mingled together, so as the water be overglutted with Salt, and being scalding hot, parboyl therein the Fowl, or Flesh which you intend to keep for some reasonable time, (that is to say, according to the greatnes and greasiness thereof,) then hang it up in a convenient cool place, and it will last a sufficient time, without any bad or over-saltish taste.

This is a good way for Sea-men, and others in hot countries, who are inforced sometimes to victual themselves in such intemperate climates where no flesh

flesh will last sweet four and twenty hours together, by reason that they have no means to make the same to take Salt, which without question will enter this way and make penetration very speedily, by reason of the hot and fiery spirit of Salt thus prepared.

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### RECEIPT XXX.

*How to make a speedy or present Drink that Travel-  
lers may brew for themselves, when they cannot  
relish their Beer or Ale at their Innes.*

**T**AKE a quart of good water, put therein five or six spoonfuls of good *Aqua-vie*, and an ounce of Sugar, with a branch of Rosemary, brew them a pretty while out of one pot into another, and then is your drink prepared.

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### RECEIPT XXXI.

*How to make on the suddain, good drink for Mariners,  
Souldiers, or for poor people, when Beer  
is scant, and Malt dear.*

**I**N time of extremity, these things following will serve to suffice nature (as hath been often proved;) Put a good quantity of wholsom fair water, a small portion or few drops of the Oyl of Sulphur, incorporating them well together, and it is ready.

*Another.*

One drop or two of the Oyl of Vitriol added to a good quantity of fair water, and well stirred together, it performeth the like.

*Some*

Some mingle Vinegar with good water, and it serveth very well to quench the thirst.

Others will carry a piece of Allom in their pocket if they are to travel, and know not how to get drink or water, and when they are a dry, they put a piece of that in their mouth, and it will fetch up moisture which will assuage the thirst.

### RECEIPT XXXII.

*A profitable way to harden Leather, that it shall outlast other Leather a long time.*

**T**His is a good and profitable Receipt for many poor labouring men, and is thus performed, Take and lay such Leather as is well tanned to soak in water, wherein there hath been some store of filings of Iron, a long time, or else in the water that hath long lain under a Grinding-stone, into which such Iron as hath been from time to time ground away, hath there settled.

This is good also to harden Leather for the Cawkers or Pumps of Ships, or others, to make them last long.

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### RECEIPT XXXIII.

*An excellent Receipt to make a dainty streight Walking staff to have knots where you please.*

**G**Et a streight piece of wood (of your desired length) of Holly, Ash, Service-tree, Walnut-tree or Pear-tree, let it be free from knots, or shakes, then plain it into six or eight sides, a good deal bigger than your

your Staff shall be; this being done, get a short Punch of Iron, and let the small end be filed about the bigness that you intend your knobs shall be filed about a bench or table, and where you will make the knobs with a hammer punch holes therein, and so do on every side, then plane it over again till you have made your staff smooth, that there be no dents seen thereon; when you have thus done, put it into some cauldron of boiling water for a good space, and when you take it out again, you shall see that it will be full of knobs, for with the heat of the water it forceth the bruises (which were made with the Punch) to swell out of the wood again.

You may file your Punch like a Star, or other work, and it will shew very pretty; I once saw a Partizan, or Captains Leading-staff, which was done in this manner, and being put into a Dyers Cauldron when he dyed blacks, when it was dryed, and rubbed well with Linseed oil, it shewed like Ebony.

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#### RECEIPT XXXIV.

*How to write a Love-letter secretly, or from one Friend to another, that cannot be discovered.*

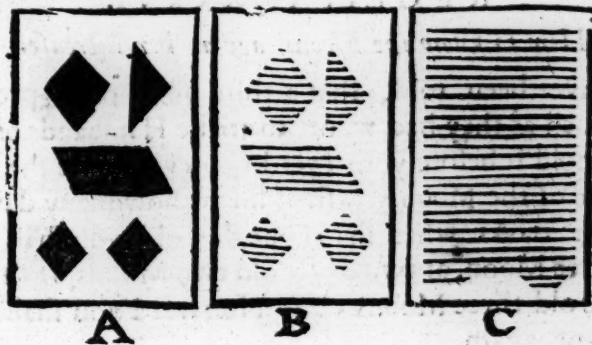
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**T**AKE a sheet of white Paper, and double it in the middle, then cut holes through both the half-sheets, let the holes be cut like the panes of Glass-windows, or other forms what you best fancy, and then with a Pin prick two little holes at each end, and cut your Paper in two halves, give one half to your Friend (to whom you intend to write) the other half keep

keep to your self : Now when you do write, lay your cut paper on a half-sheet of writing Paper, and stick two Pins through the two holes that it stir not ; then through those holes that you did cut, write your mind to your Friend ; when you have done take off your Paper with the holes again, and then write some other idle words both before and after your lines , but if they were written to make some little sense, it would carry the less suspicion ; then seal it up and send it.

When your Friend hath received it he must lay his cut paper on the same, putting Pins into the pin-holes, and then he can read nothing but your mind which you writ, for all the rest of the lines are covered, observe the Figure, and it is easily apprehended.

Where the Letter A is placed, that doth signifie the half-sheet of cut paper with holes ; where the Letter B is placed, doth signifie the substance of the Letter which you write, and where the Letter C is, doth signifie the Letter filled up with lines to joyn to the other words. Now when your Friend writes to you, he must do the like.





*Another.*

Write a Letter ( what you please ) on one side of Paper with common Ink, then turn your paper, and write on the other side with milk, (that which you would have secret) and lēt it dry; ( but this must be written with a clean pen: ) Now when you would read it, hold that side which is written with Ink to the fire, and the milky Letters will then show blewish on the other side, which may be perfectly discerned.

### RECEIPT XXXV.

*How to know when the Moon is just at the full,  
by a Glass of water.*

**T**AKE an ordinary Drinking-glass, and fill it full of water up to the very brim, so that it doth not run over, let this be done a little before that the Moon be at full, and then at the very instant that the Moon is at the full, the water will presently boyl over.

### RECEIPT XXXVI.

*How to know the Moons age at her Increase.*

**I**HAVE been told, that a thin piece of Cypress, such as they had wont to make Hat-bands of, if you hold it before your eyes in an evening at the increase of the Moon, you shall know how many dayes old she is; As when she is one day old, you shall see but one Moon, at two dayes old two Moons, at three dayes old three Moons; but afterward you shall see but one again.

RE -

## RECEIPT XXXVII.

*Another, shewing how to know both the Increase and Decrease of the Moon.*

**T**He Moon giveth such vertue to a stone which is found in *Arabia*, called *Selenite*, of which *Pliny* and others do write, that within the body of the stone the Moon sheweth her self, and increaseth and decreaseth according to the course of the Heaven.

*Another.*

Our common House-cats also have this property by the predomination that the Moon hath over them, that their Eye-brows do increase, or decrease each day according to the course of the Moon, and her aspects; which thing is daily seen to him that pleaseth to note the experience thereof.

## RECEIPT XXXVIII.

*A dainty way how to fetch Oyl, or Grease, out of Books, Writings, Papers, or Garments.*

**G**O to the Apothecaries or Grocers, and buy a penniworth or two of the Oyl of Turpentine, and put a drop or two upon the place which is Oily or Greasy, rubbing it on, and then you shall see how it will drink up the Oyl or Grease, and be presently dry and fair; for this Oyl of Turpentine is a great dryer, and is good to put amongst Oyl colours, to make them dry speedily.

D

RE

## RECEIPT XXXIX.

*How to refresh and scoure old pictures that are wrought in Oyle, making them to look almost as fresh as if they were new done.*

**T**AKE the Picture out of the frame, then wipe, or brush off the dust very clean, and then lay it level upon a board, or table, pouring good sharp Vinegar all over the same, and there let it lye and soke for three or four hours; if the Vinegar be dryed up, then pour on more, continually keeping it wet; then beat a piece of dry brick very fine to powder, and see there be no lumps or stones therein, for they will raze and scratch the Picture, and then put the powder into a course linnen rag, and tye it, and then dip it well in a Porrenger of Vinegar, and with your rag and powder, rub and scour your Picture all over very hard, and then with fair water, or a wet clour, wash the filth away: But if you see any spots or filth remain, then scour it again and wash it; then dry it very well with a cloth, and when you have dryed it, put it again into the frame, and set it in the Sun for a day or two, (for the Sun refresheth the Colours very much) and then rub it hard with a dry woollen cloath till you make it shine, and then hang it up. This will cause it to look almost as fresh as when it was new.

Some use to wash them in Soap, and then Oyl or Varnish them over, but that is not good, because that the Oyl or Varnish will turn yellow, and gather dust.

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RECEIPT XL.

*How to keep Sword-blades, Halberds, Pistols, Knives,  
Edge-tools, or other things free from rusting for  
seven years, or more, in a dry house.*

**T**AKE Fish-Glew, or Ising-glass, and cut it in pieces,  
then with a Hammer beat or bruise it upon an  
Anvile, or Stone, and then put it into a little skillet,  
or such like, with water, and let it dissolve over a  
gentle Fire, still stirring it as you do your common  
Glew, then when it is well boyled take it off, and with  
a Pensil, or small hair-brush, lay the same, while it is  
hot, all over your Sword-blade as thin as may be, and  
then lay it to dry, and it is done. This thin coat keep-  
eth the moistness of the Aire from the Mettle, that  
it cannot rust; but when you are to wear it or use it,  
take a blunt knife, and you may easily scale off the thin  
substance, and then it will be as bright as any silver.

I verily believe, that our common Glew will doe  
the like, keeping of it in a dry room.

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RECEIPT XLI.

*An excellent Cement for broken Glasses, China-dishes,  
or Cups, and such like.*

**T**AKE one part of Virgin-wax, and two parts of  
the tears, or clear drops of Mastick, melt them to-  
gether and Cement therewith. But the better is, if you

beat the whitest Fish-glew or Ising-glass with a hammer till it begin to be clear, and then cut the same into very small and short pieces, and dissolve and melt the same over a gentle Fire with Aqua-vitæ; then let one that standeth by, hold both the pieces that are to be cemented over a chafing-dish of coals till they be warm, and during their heat, lay on the dissolved Glew with a fine Pensil, then bind the Glass with Wyre or Pack thread, to keep it steady, and so let it remain till it be cold and dry.

*Another.*

Take a little quantity of unslaked Lime, wheat-flower, and the White of an Egge, and incorporate them together. Mastick, Aqua-vitæ, and white lead is good; so is Ising-glass, being dissolved and melted with Rhenish-wine.

## RECEIPT XLII.

*How to grave Armes, Posies, or other devices upon Eggs, which may be served at a table.*

**M**elt Suet pretty warm, and dip in your Eggs in this manner, hold the Egg between your thumb and your fore-finger, and quickly dig one half therein, and hold it in your hand till it be cold, and then dip in the other end that it be thinly covered all over, then take a little Bodkin or Needle, and grave in the Suet what Letters or Words you please, then lay the egge thus engraven in good wine-vinegar, or other vinegar in



n some stone Pot or Vessel for the space of six or eight hours more, or less, according to the strength or sharpness of the same, then take out the Eggs, and in hot water dissolve the Suet from the Shells, then lay the Eggeto cool, and the work will appear to be graven in the shell of Russet colour. And if the Egge lye long enough in the Vinegar after it is so graven, the Letters or Works will appear upon the Egge it self being boyled, and so you may serve them up at the Table. And if you care not to lose the meat, you may pick out the same, when the shell is through graven, and you shall have a strange piece of work performed on the same.

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### RECEIPT XLIII.

*How to make wax either red or green.*

**T**Ake to one pound of Wax in Summer, three ounces of the clearest Turpentine; but if you make it in Winter, take four ounces of Turpentine, melt these together over a soft fire, stirring them with a stick, and when they are well melted together take it off and let it cool a little, and then mix with the same the red root of *Anchusa*, or Vermillion ground an ounce; and an ounce of sweet Oyl; stir these well together again over the fire, then take it off to cool, and pour it into cold water, and then upon a wet board, and your hands wet, you may roul it into what form you please. Instead of Vermillion, you may take three times as much Red-lead, but that is not so good.

If you will make Green wax, instead of Vermilion take the like quantity of Verdigrase.

# RECEIPT XLIV.

*A pretty way how to cast off Flowers in wax, of divers colours.*

**C**Ause a Stick to be turned round at one end, (somewhat Taperwise) like the fashion of a Poking stick, lesser, or bigger, (according to the bigness of the Flower you intend to cast) and at the smaller end thereof, with your knife, cut tents or nicks in the same, long-wise as you see here in the Figure: The letter A.

signifieth the Stick, the letter B. signifieth the Flower: Then take a little panikin, and in the same melt your Wax with a gentle fire, and when it is melted take it off, and then take your Stick (having a Porringer of fair water by you) & dip the end into the



water, and then shake off the water, or suck it off, and then dip the stick into the Wax, and suddenly pull it, out again, dipping it into the water again to cool it and then you may take off your flower and lay

lay it by: and in this sort you may make as many as you please: for yellow Flowers, melt yellow Wax; for Red, red wax; for white, white wax; for green, green wax. Now for stalks for your Flowers you may stick in a small wyre, or a Bent of a raison-frail, or the like. You may have the coloured wax ready made at any of the Wax-chandlers.

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RECEIPT XLV.

*How to make a Bunch of Grapes with Green Wax,  
that will seem to be naturall.*

**Y**OU must get a little stick turned round at the end, about the bigness of an Arrow; and then have your vessel of green wax melted, (as was shewn in the former Receipt,) dipping your stick in the same about the third part of an inch deep, and it will be almost in the fashion of an Acorn cup, make a good many of them. Then take an Egge, and make a little hole in the bigger end of the shell, less than a penny, and get out the yolk thereof and dry the shell; then with a piece of your green wax hold it to the fire, rub or daub the shell therewith thinly all over, then hold the shell in your left hand, and with your other hand take up first one cup, holding the same a little near a candle to warm, and quickly stick it on your egge, and so do with all the rest of the cups, till you have filled it all over; they must be set something close together. Now when you have

thus done, take a little stick, about the bigness of the tag of a point, and tye a pack-thread in the middle thereof, and then put the stick into the hole of the shell, and so hang it up: You may cut leaves like Vine leaves in green paper; and fasten them to the string or stalk above the bunch: I have made some womens teeth to water at this conceit, they seem so natural to the eye; and these Grapes will last all the year.

### RECEIPT XLVI.

*How to grave and in-lay Colours into Gold, Silver, Iron or Copper, to shew like Ammel.*

**F**irst, cover your Mettal with a crust of warm Wax, and when it is cold, with a fine sharp bodkin draw, or cut out the shape or proportion of what you please, either Letters, Flowers, Borders, or Scutchions, of a reasonable largeness: then pour upon the same empty places (which you have ingraven upon the wax) some few drops of strong water or *Aqua-fortis*, and let them lye a while, and when you find them deep enough graven, mingle Orpiment and Mastick melted together for a yellow colour, and Vermilion and Mastick for red, and Bice and Mastick for a blew, and Ceruse for white, and Ivory burnt for a black. Now when your Mastick hath been melted with any of the foresaid colours, let it cool, and beat the same into powder, and lay the same powder within the graving, and after  
lay

lay the mettle upon a small Char-coal fire till the Mastick be melted, and it will remain fast and firm therein a long time.

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RECEIPT XLVII.

*How to In-lay Boxes, Cabinets, or other things  
with hard Wax.*

**W**ith a Pen draw upon your Box any thing what best pleaseth your fancy, as Birds, Beasts, Flies, Flowers, Fruits, Leaves, Trayls, Anticks, Letters, &c. Then take a little knife ground sharp at the point, and cut or grave out the work pretty deep which you have drawn with your Pen upon the wood; when you have so done, lay upon the same some red or green hard wax, and with a hot Iron melt and rub hard the wax all over into the crevices, or works which you have cut out, and so let it cool: then take a knife and scrape away the wax to the board, and then you shall have your work which you drew to be inlaid very perfectly in the colour of your wax, as though it were drawn with a Pen, and will never wash nor wear off, when you have scrap't it clean, hold it a little to the fire, and it will fetch a gloss on the wax, and make it to shew the pleasanter.

RE-



## RECEIPT XLVIII.

*How to harden the white of Eggs into an Artificial Gum fit for many uses.*

**S**eparate the Whites of Eggs clean from the yolks, and beat the Whites very well into a clear oyl, or water, and when it is settled, skim off the froath; then put the same into Bladders, and hang them in a chimney-corner, where fire is usually kept, to dry, and in a few dayes the same will become as hard as Gum Arabick : in hot weather you may hang your Bladders in the Sun to dry : This Gum may be used instead of other Gums, and with it you may varnish Prints, or other things that are washed in colours.

## RECEIPT XLIX.

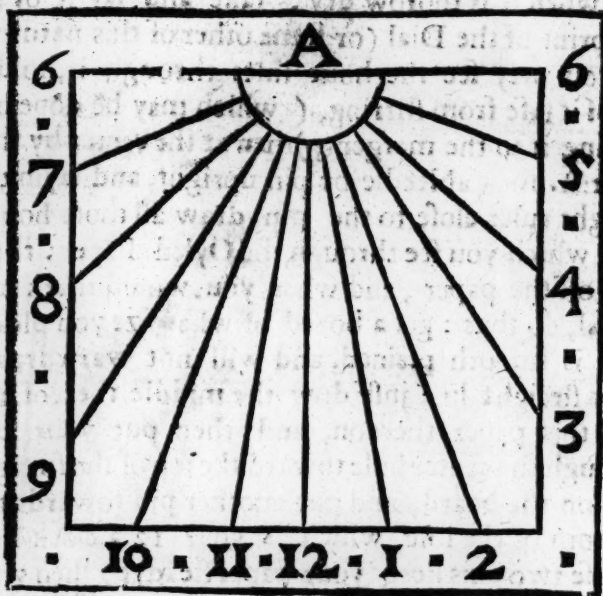
*How to make a true South Sun-dial, to be placed upright against a Wall or on a Pole.*

**I**ntend not to speak of the multiplicity of Geometrical and Artificial sorts, and making of Sundials, ( of which many ingenious Artists have copiously written ) but a Mechanick way of two sorts, for the benefit of some who would be glad to know how the hours of the day pass away.

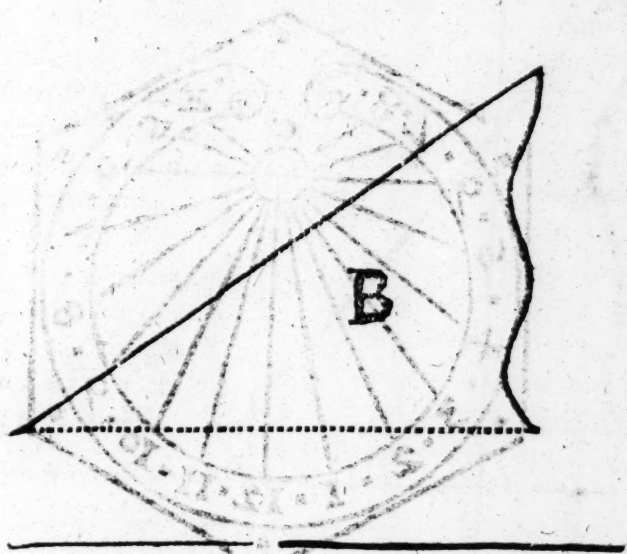
Take a piece of good writing Paper, and rub it over with Linseed-oyl, and hang it to dry in the Sun,

Sun, when it is thorow dry, take and lay it over this print of the Dial (or some other of this nature, that you may see the hour lines through it, holding of it safe from stirring, ( which may be done by pinning it to the margent, ) then at the center by the letter A. stick a Needle or pin upright, and laying a straight ruler close to the pin draw all those hour-lines which you see through the Oyled Paper; then take off the paper, and when you would mark out a Dial, do thus: get a board of what size you please that is smooth plained, and will not warp, drawing a straight line just down the middle thereof, and lay this paper thereon, and then put your pin through the center hole toward the top of the straight line on the board, and put another pin towards the bottom of the line, which is your 12 a clock line, (these two pins keep your paper steady, ) then with a small bodkin prick a hole through every hour-line of your paper into the board, and then take it off; then stick in your pin into the center hole of the board again, and laying the ruler close to the pin, and close to each hole in the board, mark and draw your hour-lines; (and note that you may extend these hour-lines to what length you please, according to the bigness of the board; ) and then figure it as you see in this example following.

Now



Now for the Cock or stile of your Diall, it must be set in the 12 hour line, and must be just equal in height from the board, as the triangular Figure marked with B. sheweth; the line with pricks is but to direct you which side must be next to the board: The Stile may be made of a thin Iron plate, and cemented in, or of a stiffe wire, the upper end of which must be put just to the center by A. equal to the 6 hour line: when this is done, you must get some Painter to paint it in Oyl-colours, and so set it up.

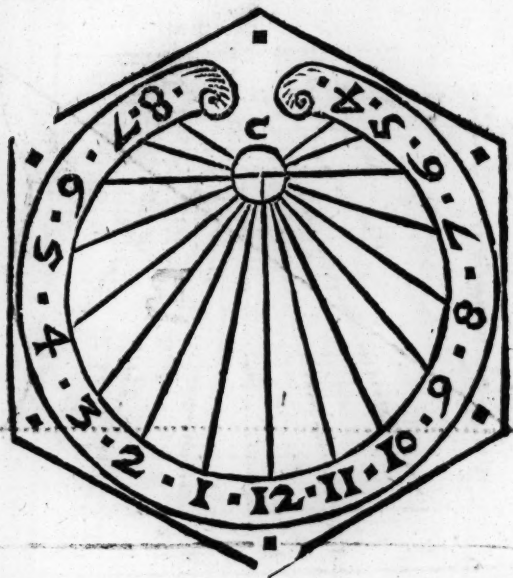


# RECEIPT L.

*How to make a Horizontal or Flat Dial, to stand upon a Post, or other place.*

**T**HIS Diall may be made into sundry forms, either four-square, fix, or eight square, or round as you please, and it is to be placed on the head of a Post either in Garden, Yard, or at the out-side of a Glass-window where the Sun cometh: behold the form.

 You

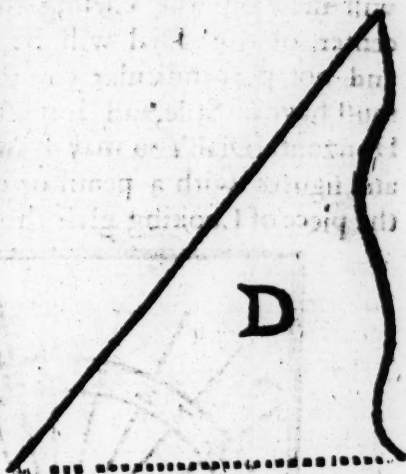


You must note, that the hour-lines of this Dial  
 do vary from the former, and so doth the Style in  
 height : But you must work with this as in the other  
 with your oyled paper, to draw the hour-lines, and  
 to make a line just in the middle for your 12 a clock  
 line. The center of this Dial is hard by the letter  
 C, and must be more near the middle than the other,  
 because it containeth more hours thereon, for the  
 other will serve but from 6 to 6, but this from 4 to 8.  
 You may make this Dial in Stone, Wood or Metall,  
 and remember to make the height of this Style or  
 Cock according to this triangle marked with the let-  
 ters, for it must be higher, as you may perceive by  
 this



this Figure. You may make Cement for to fasten the stile, with Rozen, powder of brick and some chalk, mingled together, and with a hot Iron melt it into the crevice.

*Note, That these Dials will not serve in any part of England, but within 10 or 20 miles of London.*



# RECEIPT LI.

*A pretty way to make a Sun-Dial on the Cieling of a room, or chamber, whereby you may know the time of the day, as you lye in bed.*

**I**F you have any window South-East, or South, which is best, and that is for your turn, in the lower post or frame of the in-side of your window, about the middle, fasten with wax a little round piece of Looking-glass, or other glass, about the bigness of a two-pence, (you may cut it round with an old pair of Scizzers; ) but if you place it higher in your window on a ledge, it will be the better, (as you may see here in the Figure, ) setting it level with the Horizon; and the reflection of the Sun in the Glass will

*A rich Cabinet,*

will shew on the Cieling the hour of the day, the center of the Dial will be without the window and not perpendicular to the Glass. This Dial must have no Stile, and it must be made like the last Horizontal Dial: You may draw the circle, hour-lines, and figures with a pensil or coal, the black spot is the piece of Looking-glass, the Dial is the cieling.



## RECEIPT LII.

*How to make a Candle-Dial, whereby you may know the hours of the night.*

**O**Ne Winters evening sitting by the fire, me thought there might be some device for a Candle-Dial; At length it came into my head, I made a little

little four square frame of wood, of a piece of a thin Trencher, making the in-side thereof fit for the bottom of a Candle-stick to stand in, which I did ordinarily use, on two sides of the square I fastened a little piece of Wyre, not a quarter of an inch long, and just where the Candle-stick should stand, on a Table or Board, I made two little holes with a Bodkin for the ends of the two Wyres to go into, and then I set down my Candle and Candle-stick into the square : Having thus done, I made another long Frame like the frame of a Picture, and pasted half a sheet of white paper therein upon a thin board, and so hang'd it up against the wall. Then in the Ceiling I fasten'd a small Pulley and, on that Pulley I had two little plummets of lead one broader at the bottom than the other, & ty'd them to a piece of Packthread at each end, and so hung them in a Pulley, (as you may better apprehend by the figure, the broadest Plummet I pulled down till it gave a shadow on the lower end of the



the frame on the wall, ( which is now the 1 and 7 a clock line ) and where the broad bottom cast a shadow I made a speck with my pen, and then turned an hour-glass, and when that was run out, I made another speck, which is the 2 and 8 line, and so of the rest : by these divisions, you may with a pair of compasses divide the rest of the hour line upwards, you must pull down the broad Plummēt and set it at any time to what hour you please, as by this, it shews that it is half an hour past 4 or 10 of the clock. You must remember to have your candles always of one size or weight, as of the eights, or twelves in the pound, or such as you usually burn. You may take away your Candle and candle-stick out of the square frame if you have occasion, and then set it down in its place again, which keeps all right. I have placed the Figures at each end of the hour-lines, as from 1 to 7 on the first side, and then from 7 to 12 on the other side. Note when it is just 7 on the first side, then pull down the Plummēt to 7 on the other side, which I hold to be the best way.

### RECEIPT LIIL

*How to keep Cherries, Pears, Nuts, or other Fruit a year as fresh as they came from the Tree.*

**W**Hen they are pretty ripe, cut off the stalks, and put them into an earthen pot well leaded, and then cover them well with Honey, then stop the pot

pot with Pitch, or Wax, that no ayre may enter in, and then put the pot in some Sellar, or cool place, burying it well in Sand; and so let it remain till you use it.

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RECEIPT LIV.

*How to make Grapes, and other Fruit to have no stone or kernels.*

**I**T is said, that if you do plant or set the smaller end of the twig of a vine some-what deep into the earth (which will take root) that those Grapes that will grow thereon shall have no stones: the like effect have Peaches, Apricocks, Damsons, and other Stone-fruits, if the small end of the cyons be grafted into the stocks. Also if you bend down both the ends of an apple or pear-tree cyon, and graft them on both sides of the stock; and the next year when they have grown cut the cyon in the middle, one shall bear fruit with kernels, one the other none.

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RECEIPT LV.

*How to make yellow Roses grow, and to make Trees and other things grow green all the year.*

**I**Have been informed, that if you graft a white Rose upon a Broom-stalk, or on a Furzon bush, that the same will bear yellow Roses, but they will have no sweet scent.



Also, if you will graft a Rose, or other thing upon a Holly-stock, the leaves of the same will grow green all the year.

### RECEIPT LVI.

*How to make Apples, Pears, and other Fruit of several colours, and to give them a dainty tast of Spices.*

**I**F you will give a pleasant colour to your Fruit, do thus; For a red, boyl Brasil, Turn-soyl or Sindes, and for a yellow, use Saffron, or Turmerick. Now to give them a dainty taste and smell, you must beat Cloves, Mace, Cinamon, and Nutmegs, to powder, and mixe them with the water of your colours with some honey; then with an auger bore a hole in the biggest part of the tree, unto the middle, something sloping down-wards, and then pour your water and spices into the hole, then with a pin made of the same Wood, or tree, beat it hard into the hole, and saw off the end, and wax it about: This must be done in Winter before the Spring, because when the sap riseth, the colour, scent, and taste also ascendeth with the same.

### RECEIPT LVII.

*How to know precisely on the Cieling of a Chamber, which way the wind blowes at all times.*

**T**HIS conceit did I see in King James his Bed-chamber at White-hall, the Chamber was an upper room, having a Vane, or Weather-cock of Iron

Iron placed about the top, or tyles of the house, which had a long stem of Iron, which did reach from thence through the Cieling of the Chamber, upon which Cieling was pointed a Marriners compass, with the two and thirty winds thereon, now the lower end of the stem of the Vane came through the center of the compass, unto which was fastened an index or needle (like to those in an ordinary Dial) which doth presently shew how the various wind doth shift from place to place, which you may continually know precisely, both night and day.

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R E C E I P T L V I I I .

*How to keep drink quick and fresh, that beginneth to be sowre and dead.*

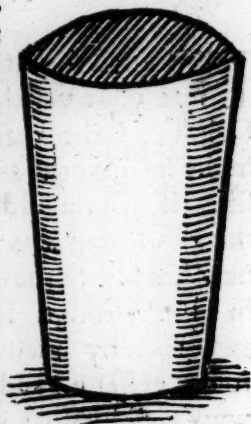
**I**T is good to put a handful or two of ground malt into your vessel, (if it begin to sail) and stir the Drink and the malt well together, and this will make it to work a-fresh, and become good again, likewise if you add new strong drink to the old, the dead drink is forced for to work again to a new head. Some do bury their vessel of drink in the ground for four and twenty hours, and thereby recover it. Others do throw into the vessel a handful of Salt. It is also good to tilt your vessel before your drink be half out, and then it will draw fresh to the latter end. But the best way is to put a handful or more, of Oat-meal into your vessel, when it is first laid into the Seller, or

Buttery, whereby it will alwayes carry a quick and lively taste.

### RECEIPT LIX.

*An excellent way for baking of Bread that it shall not be hard crusted, nor yield so many crums.*

**G**O to the Plate-worker, (such as maketh ordinary Dripping-pans) and cause him to make a pot, or Pots of his Latten-plate, which may contain half a peck, or greater, or less, as you please, according as you mean the bigness of your Loaf shall be; let this pot be made with a bottom at the lower end, and open at the top, almost like a beaker, as you may see here by this Figure, and when it is done, take a little Butter, and annoint the in-side of the pot there-with, and when your Dow is moulded put it into the same, (not full to the top) and thrust it down hard to the bottom, and then set it into an oven amongst other bread, with the lesser end down-ward; and when it is baked it will easily come out: this Loaf will have no hard crust, nor crum as other Loaves doe, and will shew smooth, standing like a Sugar-loaf upon the Table, and in a little compass.



RE.

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RECEIPT LX.

*A dainty, strong, and glistering Mortar, or Plastering  
for Cielings, or for Walls.*

**I**T is said that in *Italy* they much use this Conceit  
for Plaistering of their Cielings, Floors, or Walls,  
which is by mixing and well tempering together  
Oxen and Cowes bloud with fine Loam or Clay,  
and it will be a very strong and binding substance,  
and being well smoothed it will glister, and become  
very hard.

E 4

Some



## Some few ( but choice ) Phy- sical Receipts, &c.

### RECEIPT LXI.

*Of the great vertues of Crocus Martis, fit to be used  
at this time for the Bloody-flux, which so much  
new reigneth in the Army.*

**T**His *Crocus Martis* is a powder which you may have at the Apothecaries, this amongst all other Medicines in the world, is the most excellent that can be found against the Bloody-flux, giving it in this order. Take one ounce of conserve of Roses, and one scruple of *Crocus Martis*, and mixe them together, then let the Patient eat it in the morning, and fast thereon two hours, and this ( by the Grace of God, ) will help him, although he had it never so long, or never so sore. It is also given above all other medicines, in the latter end of a Drop-sie; and also against the Flux of Menstrues, and against bleeding at the Nose, and all other Fluxes whatsoever; it helpeth those that spit blood, it is excellent to stop the Flux in wounds, and to heal them and dry them, if ye strew the powder thereon.

RE-



## RECEIPT LXII.

*Of the rare vertue and operation of the Quintessence of Honey, for many diseases, with the Oyl of Wax.*

**Y**OU must understand, that Honey is rather a liquor Divine, than Humane, because it falleth from Heaven, upon Hearbs and Flowers, and is such a sweet thing, that the like cannot be found upon the earth; this Quintessence is of such vertue, that if any be almost dead, and drink 2 or 3 Drams thereof, he will presently recover. If you wash any wound therewith, or other sore, it will quickly heal. It is excellent against the Cough, Catarrhe, or pain of the Milt, and many other Diseases, it helpeth the Falling-sickness, the Palsie, and preserveth the body from putrefaction.

The Oyl of Wax worketh in wounds most miraculously, healing them, be the same never so big and wide, ( being before wide stitched up, ) in the space of eleven or twelve days: but smaller wounds in three or four days, by anoynting the same therewith, and laying a cloath thereon wet in the same. Moreover, for inward Diseases it is excellent; It prvokeh Urine which is stopped, it helpeth stitches, and pain in the loyns, if you drink one dram thereof in white Wine, it helpeth the cold Gout, or Sciatica, and all other griefs coming of cold.

RE-

## RECEIPT LXIII.

*Of the manifold operations of the Oyle of Cinamon.*

**T**His Oyle is of a miraculous nature, for it pierceth through the flesh and bones, being very hot and dry, and is good against all cold and moist diseases, being comfortable for the head and heart, working the same operation on a dying man as the former. To be short, this Oyle is of such operation and vertue that if a man drink never so little, he shall feel it work to his fingers and toes ends, therefore it pierceth through the whole body, helping all Diseases that come of cold and flegmatick humours, it avail-eth much with Women in travell, it driveth away the Measels and spots, if the face and hands be anoynted there-with it warmeth the breast, and helps the cold Cough, it consumes all cold Fluxes that proceed from brain and head, and causeth quiet sleep. In brief, this Oyl may be used instead of the natural Balm for many diseases.

## RECEIPT LXIV.

*How to Distill, and make Oyl of Rosemary Flowers, with its vertue.*

**T**Ake Rosemary flowers and stamp them, then put them into a glass with strong wine, and stop it close, setting it in the Sun for five or six dayes, and

and then distill it with a soft fire, and you shall have both water and oyl, which you must separate, keeping the Oyl close in the Glass, whose vertues are these.

It helpeth against all pains in the Head, although they have continued seven years, it comforteth the memory, and also preserveth the eyes, if you drink now and then a drop or two, and put another into the eyes, it helpeth those that are deaf, if it be put into the ears, and also drunk with good wine, it openeth all stoppings of the Liver and Milt, and helpeth against the Drop sic, and yellow Jaundise, it breaketh wind, easeth Cholick, and rising of the Mother. It is also excellent against the Pestilence, or those which have drunk poyson, if they drink of this Oyl, and lay them down to sweat: It comforteth the heart, and cleanseth the blood, and maketh a man merry, and causeth a good colour: It helpeth those that have Canker and Fistula, and such like. And to be brief, it helpeth all the diseases of the body that come of cold and moist humours, although they were never so evil.

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#### RECEIPT LXV.

*How to help Deafness, and to expell wind from  
the Head.*

**T**AKE five or six drops, or more, of the Spirit of Wine, or good Aqua-vitæ, in a spoon, and holding down your head on one side, let one pour the

the same into your ear, let it continue there about the space of half a quarter of an hour, still holding your head aside that it run not out, and then you shall hear a most terrible noise and rumbling in your head, which is the wind, then turn your head aside, and the water will run all out again very hot. Now when you have done thus much on one side, you may do as much on the other, but be sure to keep your head warm after you have done. This I have often proved, and found ease thereby.

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### RECEIPT LXVI.

*How to give ease, and help the raging pain of the teeth  
without drawing,*

**T**His is also performed with the spirit of Wine, or good Aqua-vitæ (as you have read in the former Receipt) by pouring it into the ears, especially on that side where your pain lieth: but after that you have let the water run forth of your ears, then with more of the same water (against the fire) you must rub and chafe your cheeks, and under your jaws, and behind your ears, stroking of them upwards with your hands toward the neck, to drive back the humours: for it is nothing else but a cold rheum that distilleth from the head into the gums which causeth the pain: therefore be sure to keep the head very warm when you have done.

I have

I have been certified (but how true it is I know not) that three teeth taken out of a dead mans skull, and sowed in a clout, or piece of leather, and worn about them, which were much subject to the Tooth-ach, gave them present ease, and they never were troubled with the same so long as they had those about them.

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RECEIPT LXVII.

*A dainty Receipt for curious Artists, or others, to strengthen and comfort the eyes.*

**T**His Receipt I had of a curious Ingraver, and my Friend, who every morning before he went to work, in the corner of his Hand-kerchief, (or a clean linnen rag) did put a few drops of Aqua-vita, and with the same did wipe the corners of his eyes, eye-browes, and temples, which did keep back the Rheum, and greatly did strengthen and comfort the eyes; of which I have often made triall, and found much comfort.

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RECEIPT LXVIII.

*Of Fractures, which are bones broken, and also of Dislocations, or joynts displaced, with their cure.*

**M**Any times it happeneth that Leggs, Arms, and Fingers are broken, or out of joynt, and the Parties so hurt are void of help, by reason they have no Chirurgeon near them, therefore for the relief of such



such persons, I have here set down some directions, by which they may be eased of their pain: But I would not wish them to trust to too much of their own skill, if they have any expert Chirurgeon near hand to do it.

If a Legge, or an Arm be broken, then have a care to place the member in the same manner as it was before, which you shall do in this manner.

Take a towel, and make it fast above the place where it is broken, and then take another towel, and fasten it underneath the place where it is broken, then cause two men to pull those two towels, that they may thereby extend, or stretch out the member and when the member is stretched forth at length place the broken bones as they were at the first, and so by little and little let them slack their pulling: then have a cloath ready so bigg that it may compass the whole member, wet this cloath in white of Eggs, and Oyl of Roses mingled together, and lay it on the grieved part, then roul it about with a linnen Rouler of four fingers broad, and two yards long, wet the rouler in water, and vinegar mingled together.

First, roul it about the fracture three or four times, then down-ward, and then upward, and so fasten it, then roul it with another rouler in the same manner, on these place thin splints of light wood armed well with tow, one fingers breadth from each other, and binde them on with tape, then place the member on some soft Pillow for twenty dayes: but if a painfull itch do arise, open and foment the place with warm water, and then anoynt it with *Unguentum Album*, and roul it up again.

If that a finger be broken, roul it with a convenient rouser, and splint it and use the means aforesaid.

## RECEIPT LXIX.

*A precious Salve for all those that have had any member out of joynt, called Jeremy of Brunswicks Salve.*

**T**His famous Chirurgeon, with this Salve, hath healed those that had formerly their members out of joynt, or those that had been wounded and could not stir or bow the member where they had the hurt; for by this Salve did he bring many stiffe and crooked joynts again to their former strength, to the great admiration of all men, both Chirurgeons and others.

### *How to make the Salve.*

Take two ounces of old Hogs-grease, and of Ducks-grease, and Goose-grease, Hens or Capons-grease, of each two ounces: Linseed-meal, Fenugreek-meal, of each two ounces, Oyl-olive eight ounces; Opopanax, Mastick, and Frankincense, of each an ounce: dissolve the Gums in white wine that are to be dissolved and powder the other, mingle them all together, and adde wax and turpentine to them, then boyl them all together with good stirring.

RE-

## RECEIPT LXX.

*How to order and dress a Wound, when it is first hurt,  
with the remedy.*

**F**irst, remove all such things as are in the wound, as clotted blood, wood, iron, or the like, then dry the blood with a cloath or sponge, and wash it with cold white wine, and apply some unguents or Balmes to the same, and on that a plaister fit for a wound, then roll it gently, and in a good form, for that helpeth to hasten the cure.

If the wound be of any length, you may stitch it in three or more places, but be sure for to leave a place at the lower part thereof, for to purge it self thereby.

## RECEIPT LXXI.

*An excellent Unguent, or Liniment for green Wounds,  
especially for those in the head.*

**T**Ake of the best Turpentine an ounce and a half, and as much of Gum Elemi, of Capons-grease an ounce, melt these at the fire, and mingle them. When you use it, melt it, and annoynt the edges of the wound, and dip a pledge of lint in it, and then lay a plaister on the top of the same, and roll it gently.

RE-

RECEIPT LXXII.

*How to make a soveraign Oyl, or balm for all wounds  
simple or confused.*

**T**AKE three pound of common Oyl, two pound  
of Turpentine, wheat that is cleansed five oun-  
ces, Saint *Johns* wort a pound, Valerian, Carduus Be-  
nedictus, of each fourteen ounces; bruise the Hearbs,  
and infuse them in white-wine six or eight houres,  
then put thereto the Wheat and Oyl, and boyl  
them on an easie fire, till the wine be consumed;  
then strain them, and put the Turpentine in, and  
then boyl them again on a soft fire to perfection.

RECEIPT LXXIII.

*An excellent Emplaister, which is good for all wounds  
or Ulcers.*

**T**AKE Deers suet four ounces, Rosin, and Per-  
rosin, of each a pound and a half, white wax,  
and Frankincense, of each four ounces, Massick an  
ounce; melt the wax and suet, and powder the gums,  
and put them together, and when they be melted,  
strain them through a piece of Canvase, then add  
to them a pottle of white-wine, and boyl them all to  
the composition of the wine, with continual stirring,  
and then take it from the fire, and when it is almost  
F cold,

cold, put thereto four ounces of turpentine washed in white wine, and of camphire powderd two ounces ; then make rouds of it and keep it for your use.

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RECEIPT LXXIV.

*Another excellent Plaster for Wounds in the Breasts, or other parts.*

**T**AKE Rosin that is fresh, clear and sweet, a pound, Oyl of Bayes, and turpentine, of each two ounces ; Gum Elemi sweet and good four ounces ; melt the Rosin and Gum together, and stir them well ; then put in the Oyl and turpentine, and let it boyl, with continual stirring, and then strain it, and reserve it for your use in a close pot.

When you use it spread it on a piece of leather, bigger than the wound by three fingers breadth, and make a hole in the middle of the leather for the corruption to run forth, this doth it without tent or pledget, dress it twice a day in the Summer, and once a day in the winter.

This plaister is good for all wounds in the breast, or other parts, for it draweth the hollow parts of all wounds, and strengthens the parts, clearing them from unnatural matter, and dryeth all wounds caused by thrusts.

RE-



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RECEIPT LXXV.

*Of the general significations of sicknesses, either present  
or near at hand.*

**T**Hese following Presages and tokens of sicknesses are worth the observation of all men, First, to prepare themselves for God, if he be pleased to call them otherwise that they may in time, before they be too much spent, have the counsel and help of learned and expert Physicians.

*Signs of Sickness are these.*

If the body be hotter, colder, moyster, dryer, leaner, fatter, or the colour more pale, or more swarthish, or the eyes more hollow than they were accustomed to be, and on the sudden change, all these are certain fore-runners and messengers, that the body is disposed to sickness, or already sick.

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RECEIPT LXXVI.

*Of the signification of the several colours of some Urines.*

**T**He colours and Symptoms of Urines are many and various, as are the Diseases, and therefore ought to be judged on by the learned: but thus much in brief.

Red and thick urine, betokeneth sanguine.

Red and thin, betokeneth melancholy.

White and thick, signifieth flegm.

F 2

White

White and thin, betokeneth melancholy.

The highness of the colour signifieth heat, but the pale, black, or green, betokeneth cold.

Also, the grossness, or thickness of the urine signifieth moisture, the clearness, or thinness, dryness.

Urine of the colour of bright Gold, or of the colour of Gilt, signifieth perfect digestion, or health.

Red as a red Apple, or Cherry, or base red like bole Armoniack, or red like glowing fire betokeneth excess of digestion.

Clear and white like water, or gray as a horn, or white like whey, or the colour of a Camels hair, signifieth lack of digestion.

Pale, like to broth, or flesh sodden, betokeneth the beginning of digestion.

Citrine colour, or yellow, sub-citrine, or paler, signifieth the middle of digestion.

Colour of a Beasts liver, or of dark wine, or green like to Cole-worts, sheweth aduersion of humours.

Urine of a leady colour, or black as ink, or black as horn, or dark above, and clear beneath, betokeneth feebleness of nature, mortification, and death.

The



# The School of Artificial Fire-Works.

## FIRST.

*The order and making in a true proportion all sorts of Moulds for Fire-works.*



**B**Efore you proceed to the making of Rockets for Fire-works, it is requisite to understand how to order, and make your Moulds and other instruments for the same, and first for your moulds You must provide a piece of good dry Box, Holly, Walnut-tree, Crab-tree, or some such like tough wood, without shakes or knots, and when you have thus done, it is fit to know of what length and breadth you desire to have your Mould, for following this kind of proportion, all other sorts of moulds are made great and small, therefore you ought to have a Turner to turn and bore the same: as for example; I would have the hole of a Mould bored but an inch diameter, or wide, then the length of the Mould must be six times so long as the hole is wide ( which is six inches ) and on each side of the hole half an inch thick: So that when the Mould is

F 3

turned

turned round, it is two inches over in breadth. When you have done this, you must have a bottom made and is to be fitted in this manner, as is described by the letters in the Figure following.

A. Is the foot of the Mould, and must be in height two inches, and must be in breadth an inch and a quarter, whether it be square or round.

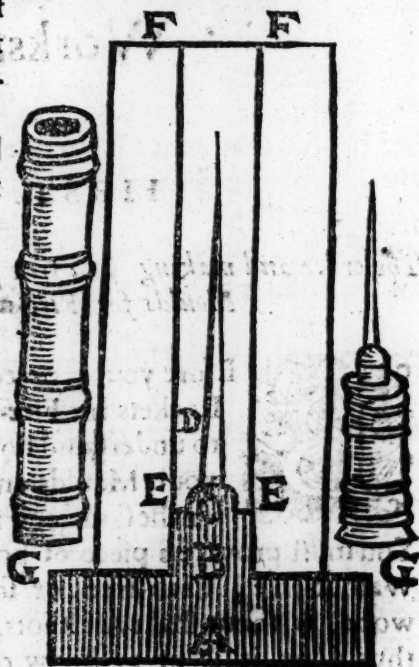
B. Serveth only for a stay, and must rise one inch into the Mould, and so proportionable in all other moulds.

C. Is for the mouth of the Rocket, and is in breadth two third parts of an inch, and then setting one foot of a pair of Compasses in the middle or center, describe the arch, which is the full height required.

D. Is the length and bigness of the Needle, which is two third parts, the length of the mould and the bigness of the bottom one sixth part, the breadth of the bore and taper toward the top.

F. E. Serveth for the Paper being rouled, and must be one sixth part of the breadth on each side.

F. F. Is

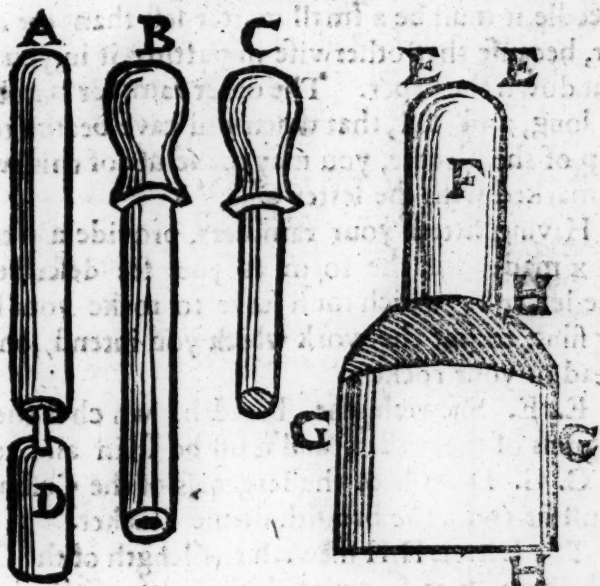


F. F. Is the thicknes of the mould, which is half the breadth of the bore, that is in this mould half an inch.

F. G. Is the length of the mould, which is six times the breadth.

2. *The order and making of Rowlers, Rammers, and other things for the Coffins.*

**H**AVING provided your mould, then you are to fit your Rowler, which must be two third parts of the breadth of the bore of the mould, and the length thereof six inches longer than the mould, which is for rouling of your paper, and is described by the letter **A** in the figure following, with a hole to be



bored in the bottom to receive a Wyre, which must



be fastned in another piece of wood some what shorter, to take out at your pleasure, which is described by the letter D, the use thereof shall be described, when I shall shew the order of making the Coffins.

When you have fitted your rocket, then proceed to the making of your rammers, which must always be two at the least, for each several Mould as they increase in largeness, so you must be fitted with several rammers, by reason of the Taper Needle: the manner and form is described by the letters B, C, in the figure following.

B, Is the hollow rammer, and hath a hole in it answerable to the length and bigness of the Taper Needle, it must be a small matter less than the roller, because that otherwise in putting it in, you will put down the paper. The other rammer is not half so long, and sad, that when you have beaten to the top of the Needle, you may make use of this, which is marked with the letter C.

Having fitted your rammers, provide a piece of Box made after the form as you see described by the letter F, which must serve to make your large Coffins, to put the work which you intend, on the head of your rockets.

E. E. Sheweth the breadth, which is the just bigness of the rocket, and must be so in all sizes.

G, G. Describeth the largeness of the Coffin, and must be twice the breadth of the Rocket.

The Letters H, H, sheweth the length of the Coffin which ought to be twice the breadth of the rocket, but you are not tyed to that so precisely, because


you

you may alter that according to the work which you put therein.

3 *How to order, and make the Coffins of paper.*

**H**AVING explained the manner and form of the moulds, with the other things belonging to the same; I will now shew the use of them in their several orders: and first for the use of the Rowler, described by the letter A. in the Figure before.

Provide you some good large strong Paper for your work: and to know what length your Paper must be, let it be always the length of your mould, so shall you have one breadth left above the mould, the use whereof shall be shewed hereafter. Now having provided your Paper in length ready, take your rowler and one length of Paper, and begin to roul; when you have rouled one sheet you must have a board with a handle, to roul it with, (the board is marked in the Figure following with the letter B. ) which must be done in this manner: you must hold the rouler in your left hand, and with your right hand hold the board by the handle, and then lay down your rowler upon some smooth chest, or table, which when you have done, roul another length of Paper, and so proceed in rouling between every sheet, untill you have rouled on so much, as will fill the mould very streight. When you have thus done, draw forth the rowler about an inch, and then take the other short rowler, which is marked with the letter D. in the other Figure, and put it in as you  
see



see described, and there you shall have a place left for the choaking of the rocket, of which is next following.



*The order and manner how you shall choak a Rocket.*

**W**hen you are to choak a Rocket, you must have an Iron hook, or a staple driven into some post, to which you must fasten your cord, which must be bigger or less, according to the bigness of your Rocket, by reason that a small cord will not choak a great Rocket for want of strength and a great cord will not serve for a small one, in regard that it will make too great a choaking, so that you must have a bigger and a less; and when you have so done, you must tie one end of the cord to the hook or staple, and at the other end, about a yard off, tie a strong stick, in fashion of a swing, it must be

be strong because it beareth the weight of the body,  
(as you may see in the Figure following, marked  
with the letter K ) which when you have provided  
put the stick between your leggs, and wind the cord  
about the Rocket-case in the place appointed, which  
must be between the long rowler and the short, when  
that is done, girt it by degrees, ever turning the  
rowler, to the end it may come together more close  
and neat, and when you have sufficiently choaked it,  
draw forth your short rowler, and where the choak-  
ing is, tye it about with strong Pack-thread, and then  
draw forth the rowler, your Coffin is re dy to be  
filled when occasion serveth, the form whereof fol-  
loweth, by this letter A.



5 *The manner of driving a Rocket, with the Instruments belonging thereto.*

**Y**OUR Coffin of Paper being finished, take it, and with your hollow Rammer, force the same down close into the mould, and when you have done, strike two or three hard blowes to settle the Paper into his right form: Which being done, then you must fill the Coffin, in doing whereof you must have a care, providing a measure which may contain but the twentieth part of your whole Rocket; so by that means you shall not fail, but every Rocket shall have a true proportion alike: as for example; I have a Coffin, which being filled, will hold an ounce of mixture, or thereabout: then I take the twentieth part, & when I find what quantity it is, I make a measure of horn or Lattin marked with the Letter F. which shall contain so much, and then I begin to fill my Coffin with one measure at a time, and putting in my Rammer, I strike four or five smart blowes with a good heavy mallet, and then fill another measure, and strike again, so I continue till I come to the top of the needle, then I take the said Rammer, and so continue with it, till I come to the top of the mould: now the paper which is above the top of the mould must be turned down and beaten hard; which being done the rocket is finished from the mould, which being forced out with as much ease as you can, for the less you force it, (being filled, and the Needle taken out,) the better it is, for knocking loosens the Powder, & so causes the Rocket for to fail. You should have a Funnel to fill your small rockets, which is marked with the letter G.





*6 Of the Composition and Receipts for your Rockets.*

**H**AVING thus finished your Rockets, it now rests to know the Receipts; For in the making of them, the chiefeſt thing to be regarded is, the composition that they ought to be filled withall: forasmuch as that which is proper to Rockets which are of less sort, is very improper to those which are of a greater size: for the Fire being lighted in a great Concave which is filled with a quick composition, burns with great violence: and so contrary, a weak composition being placed into a small Concave, maketh no effect: Therefore we shall here deliver Rules and directions, which may serve for the true composition, or matter wherewith you may charge any Rocket; from Rockets which are charged but with one ounce of powder, unto greater, which require for their charge ten pound of powder: and here follows the ingredients for severall Rockets.

First,

First, for Rockets of one ounce.

Unto each pound of good musket powder beaten, put two ounces of small-coal dust, and with this charge the Rocket.

For Rockets of two or three ounces.

Unto every four ounces and a half of powder-dust add an ounce of Salt-peter, or to every four ounces of powder-dust add an ounce of Coal-dust.

For Rockets of four ounces.

Unto every pound of Powder-dust, add four ounces of Salt-peter, and an ounce of Coal-dust, but to have it more slow, unto every ten ounces of good powder-dust, add three ounces of Salt-peter, and three ounces of Coal-dust.

For Rockets of five or six ounces.

Unto every pound of Powder-dust, add three ounces and a half of Salt-peter, and two ounces and a half of coal-dust, and an ounce of Sulphur, and an ounce of File-dust.

For Rockets of seven or eight ounces.

Unto every pound of Powder-dust, add four ounces of Salt-peter, and three ounces of Sulphur.

For Rockets of ten or twelve ounces.

Unto the former Ingredients, add half an ounce of Sulphur, and it will be sufficient.

For Rockets of fourteen, and sixteen ounces.

Unto every pound of powder-dust, add four ounces of Salt-peter, of Coal-dust two ounces and a quarter, of Sulphur and File-dust, an ounce and a quarter.

For Rockets of one pound.

Unto every pound of Powder-dust, add three ounces of Coal-dust, and an ounce of Sulphur.

For

For Rockets of two pound.

Unto every pound of Powder-dust, add nine ounces and a half of Salt-peter, of Coal-dust two ounces and a half, of File-dust one ounce and a half, and of Sulphur three quarters of an ounce.

For Rockets of three pound.

Unto every pound of Salt-peter, add six ounces of Coal-dust, and of Sulphur four ounces.

For Rockets of four, five, six or seven pound.

Unto every pound of Salt-peter, add five ounces and a half of Coal-dust, and of Sulphur two ounces and a half.

Here note in that in all great Rockets there is no powder put, because of the greatness of the Fire, which is lighted at once, which causeth too great a violence, and therefore ought to be filled with a more weak composition.

Now when you have provided your Powder, you must first meal it, and then searce it, so that it may be free from any corn, though never so small. Likewise take good dry coal, well burnt, and beat it to dust: searcing it very fine, which when you have done, mix them according as your occasion requireth, and follow your directions.

7 *The manner of heading a Rocket, with the order of capping it.*

**I**N the manner of heading a Rocket, you must use the thick Rowler, which you may see described by the latter F. in the second figure: upon which you must rowl some paper, or fine Paste-board, and past it so that it may be very close, and then choak it at the length of the thicker part, so that it may come close to your stick in the lesser part, which will be fit to be tyed to the top of the Rocket: so shall you have a Coffin to put in your works, which must be of divers sorts. This being done you must provide taper Caps, which must be joyned to the top of the large Coffin: The use of them is to keep in your works, & to cause them to pierce the Air more swiftly. The manner of making these Caps, is to take a pair of Compasses, and describe a circle in a Paste-board; then cut it out with a pair of Sheers, and that will make two caps, being cut in the middle, and turned one corner under the other, and so pasted: and let them so pasted, be put in a Napkin-press till they be dry, and when they be dry, cut out a half circle in Paper, which shall fit round about the said cap, and shall serve to paste on the cap to the coffin; So you have all things ready to the finishing of your Rocket, which must be done in the manner which followeth. R. in the next figure, is the crackers fastned to the top of the Rocket, S. is the cap, T. is the Fisgigs finished, H. is the stick tyed to the Rockets.

8. *The*

8. *The manner of fastning a Rocket.*

**H**AVING driven your Rocket, as I have shewed; with the Paper turned down, you must first prime it, which must be with cotten wick made for that purpose, which you must put into the vent, leaving a piece to hang lower than the mouth of the Rocket by three or four inches; which being done, tye a piece of Paper over the mouth, that it may not fall out. Now having primed your Rocket, you may proceed to the heading of it, and that is done after this manner.

Take your Rocket, and on the head you should turn down the Paper, you must with a Bodkin pierce two or three holes, that when the Rocket hath spent it self, the works which are in the head may take fire; which holes prime with a little Powder-dust, and then put on the head, with the choak ing fitted to your Rocket, which must come over the same in such manner, that the bottom of the greatest part must come even with the top of the Rocket; which tye fast to the Rocket with thread, and then put in your works; but before you put in your works, whether they be Stars, or any other works, you must put in a little cotten-wool, being rouled in Powder-dust, to make your Stars to take fire, or likewise may blow out: Having thus done, put in your Stars, or other works, and if you make more than one tire, (as you may



do of your Stars ) then you must put more Cotten ouled in powder-dust among them, or between every tire, that they may all take fire; then take your Cap, and fill the hollow place with Cotten, because it is light, and likewise will fire quickly; which being fitted, paste it close to the top of the coffin, that it may stand upright; then must you fit your stick, for the poynting of your Rocket, which ought to be eight times the length of the Rocket without the head: You must get the smoothest and lightest you can, such as Basket-makers use, and then cut one side of it flat at the great end, then make two notches on the round side, that the one be differing from the other, so much as is between the choaking of your Rocket, and the end of the Vent, for if you should tye it upon the Vent it would loosen the Powder, causing it to break in the Firing: be careful that you tye not the wrong end of the Rocket uppermost, but tye that end downward that is choaked, and with a piece of thread that is strong, tye it to the lower notch about the choaking. When you have tyed that, then tye the other higher, and let the stick come even with the top of the Rocket, the manner whereof is shewed in the next figure, by the letter G. Then poyse your Rocket, by laying it on your finger two or three Inches from the mouth; and if you find the stick be too heavy, cut it shorter, till you find your rocket to ballance your stick, for if the stick be too heavy, the rocket will be a slug, and being too light, the rocket will fall before it be half up. These things being provided, you have your rocket ready to be fired, which must be after this manner following.

9 The manner of firing Rockets, with the description of a Staffe for the same.

**Y**OU must provide a long staff, with a Pike at one end, to be thrust hard into the ground, with a three-legged staff, having a hollow hoop at the top, to let this long staffe slide up and down, to the end that having Rockets whole sticks are longer than the staffe, yet by raising it through the said Iron hoop, you may make it four or five foot longer than it would be, standing on the ground. Now this long staffe must have a sliding place cut with several points, which must be near the top; and at the bottom there must be a ring of Wyre, to let the stick go through; which must be made likewise to slide up and down, so thrusting the small end through the said Ring, your rocket will rest upon that part above, which must be just opposite in a streight line; so open the mouth of your rocket, and pull out the end of your Cotten-wick, and with a piece of Match fastened in a Linstock, give fire to the wick and by degrees you shall see it fire your Rocket; which ordered well, will mount very streight and high. Thus having shewed the whole order of composing a rocket, with firing of the same, I will in the next place shew you the order for making of stars, and other works, which are necessary for the heads of your rockets. The Figure of the rocket and the staffe are here presented.

The Letter G. is the rocket with the long

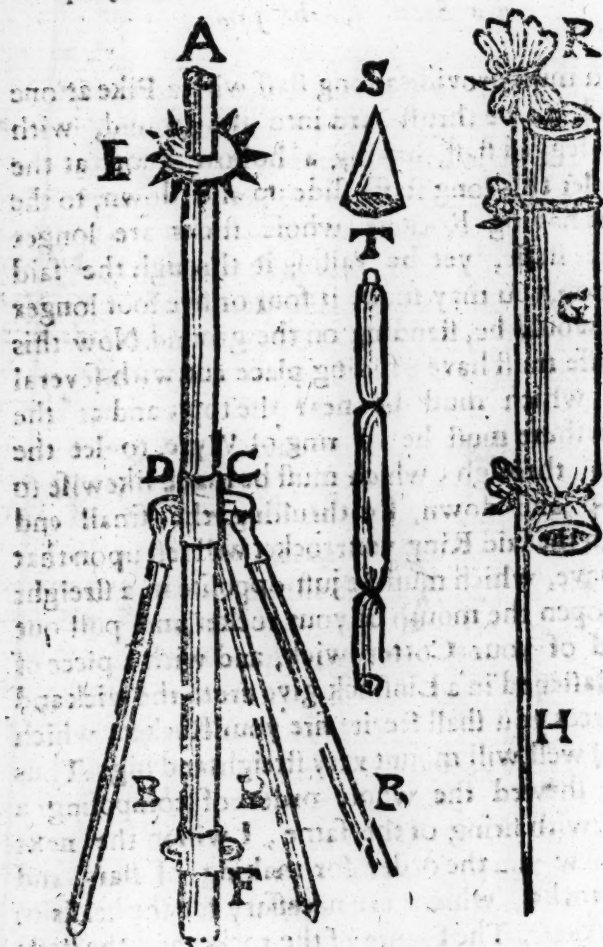
A. The long Staffe to rise through the ring.

G 2

B. B. B.

**B. B. B.** The three legged Staff.

**C.** The Ring or Hoop of Iron, for the long staff to slide through.



**The Screw to fasten to the long staff being raised.**

**E. A**

E. A piece of Iron filled with notches to hang the Rocket on.

F. The Ring of Wyre to put through the stick, to be raised higher or lower.

G. Is the Rocket.

H. The long stick.

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10 *Several compositions for the ordering of Stars of several colours.*

**I**F you will have your stars of a blew colour with red, then take eight ounces of Powder meal-  
ed, of Salt-peter four ounces, and of Sulphur vive  
twelve ounces: Meal these very fine, and mix them  
together with two ounces of Aqua vitæ and half  
an ounce of the the Oyl of Spike, and let it be dry be-  
fore you use it.

If you will have a beautiful white Fire, take  
four ounces of Powder, twelve ounces of Salt-pe-  
ter, six ounces of Sulphur vive, and half an ounce of  
Camphire: meal your ingredients and mix them.  
Now to powder your Camphire, you must use a  
Brass mortar and a pestle, dipping it in Oyl of Al-  
monds, so stirring it by degrees it will powder, and  
then keep it close from the Ayre till you use it, or  
the Camphire will lose its spirit.

If you will have a white Fire, and to last lon-  
ger then take four ounces of Powder, one our  
Salt-peter, eight ounces of Sulphur vive, one  
of Camphire, and two ounces of Oyl o

G 3

8 3  
ounce of  
Peter :  
meal

meal those which are to be mealed very fine, and mix them according to the former directions.

*§ 1 The order and manner of making the best  
sorts of Stars.*

**H**AVING shewed the Composition for Stars, now I will shew you how to make them, which is thus: You must make little square pieces of brown paper, which fill with your composition, and so double it down, rouling it till you make it somewhat round about the bigness of a Nut or bigger, according to the size of the Rocket, you may put in a dozen on the head of a small Rocket, binding them round with a thread, and then draw a cotten wick through them, being prepared for priming.

Also there is another way which is thus: take a small Rowler, about the bigness of an arrow, and roul a length of paper about it, and paste it round, letting it dry, and then you have a hollow trunk of this paper, fill this with your ingredients, thrusting it hard till it be at the top, and then cut it into short pieces, about half an inch long, and then in warm glew dip one of the ends therein, and let them drie to the end that both ends of your Stars fire not, and then put the other end into Powder-dust; you may put them on your Rocket, in one or two tires, putting in Powder-dust between every tire, that they may all take fire.

The priming is thus made, Take Oyl of Camphire soaking cotten wick therein, and being moist  
roul



roul it in fine Powder-dust, and then hang it up till it be thorow dry, and then keep it close from ayre till you use it, or the spirit of the Camphire will decay.

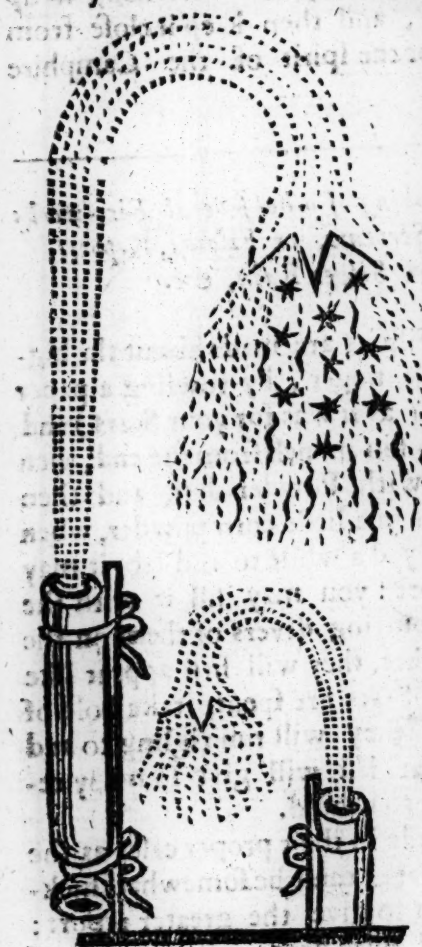
12 *The order and making of other several Fire-works for the Rocket, as Serpents, or Fisgigs, Reports, Golden and Silver Rain, &c.*

**T**He Serpents or Fisgigs are made about the bigness of ones little finger, by rowling a paper upon a small rowler, (as it was for your Stars) and choaking the paper Coffin an inch from the end, then fill it three inches with Powder-dust, and then choak it, and then put in a little corn powder, when your serpents have played a while to and fro, it may break and give report: you may fill it with the Star mixture, and putting divers of them on the head of the large Rocket, they will first appear like Stars, and when the Stars are spent, take hold of the powder-dust, and they will run rigling to and fro like Serpents, and at last will give so many reports, very delightful to behold.

The reports are made in their proper cases as the Serpents are, but the paper must be somewhat thicker, which will cause it to give the greater report: These are to be filled with grane powder, or half powder and Star mixture.

To make the golden Rain, you must get store of Goose-quils and cut them off next the feathers, and fill these quils hard with the same composition that

is in your Rocket, and must be put on the head of

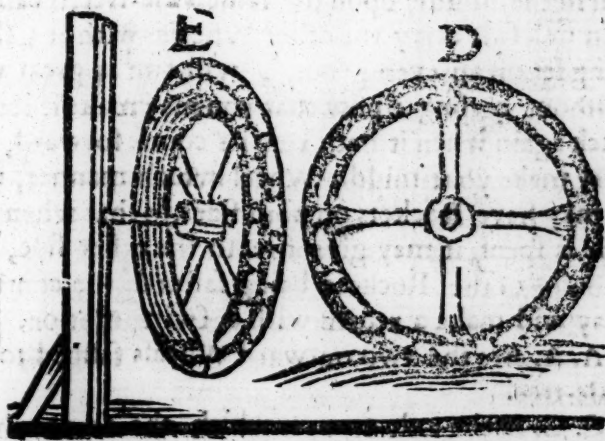


the Rocket with the open end downwards: If it were possible to put a thousand of these quils upon the head of a Rocket, it were a dainty sight to see how pleasantly they spread themselves in the ayr, and come down like streams of gold much like the falling down of Snow, especially if the wind be any thing high.

If you will make silver Rain it is performed as the other, only you must fill your quils with the same ingredients that you did your white Stars.

13 *How to make your fire-works to run upon a line backward and forward.*

**T**AKE small Rockets, and place the tail of one to the head of the other, tying a Cane to them to run on a line soped ; the line may be a hundred yards long . or longer if you please, being well stretched and set on stakes, as you may see in the figure following ; as admit the line to be ABCDEFG. and if you give fire to the Rocket at A, it will fly to B, and then come back again to A. Then fire another to C and that will fly to D, and back again



to C, and so of the rest : And at the last ( if you please ) may be placed a pot of Fire-works, which being fired will make good sport, having Serpents and other things in it, which will variously intermix themselves

themselves in the air, and upon the ground, and every one will extinguish it self with the report.

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*14 How to make a Wheel of Fire-works to run forward and backward upon the ground.*

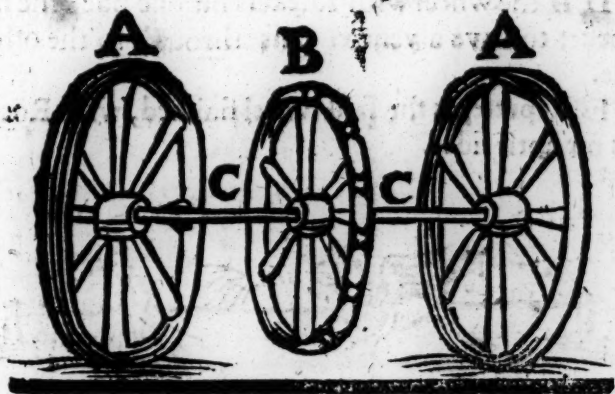
**Y**OU must get a pair of light Wheels like Spinning Wheels, both of a bigness, which must be fastned to a small light axle-tree, in such manner, that they may not move about the same, and on the middle of the axle-tree, fasten also a Fire-wheel (as you may see in the Figure following) which must not be so big in compass as the two other wheels, because it must not touch the ground, so that being fast in the middle upon the same axle-tree, it cannot run unless it carry the other Wheels with it; these being set on an even ground, will run a great way without ceasing: now that you may make it return back again when it hath run its course forward, you may make your middle Wheel in such manner, that it may have Rockets on both sides, so that when one side is spent, it may give fire to the other side, the mouths of the Rockets being fastned the contrary way will make a return with a swift motion.

A. A. Are the two outward Wheels fastned to the axle-tree.

C. C. Is the axle-tree on which the three wheels are all fastned.

B. Is

B. Is the Fire wheel in the middle, and carrieth it not so great a compass as the other two wheels.



15 *Another way for a single Wheel to be placed on a post to turn both ways.*

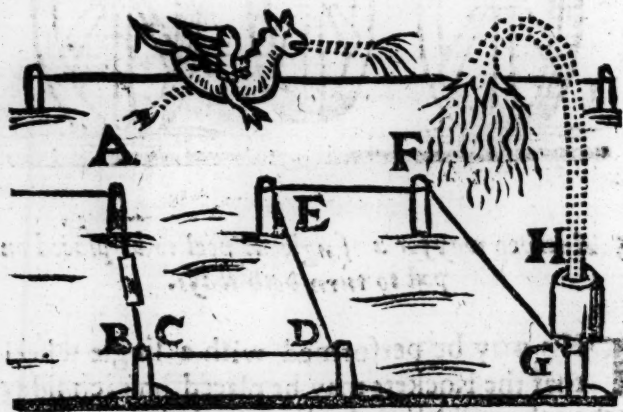
**T**His may be performed with a single wheel so that the Rockets may be placed on each side (as in the other middle wheel with a hole from the one side to the other for a vent ; then place your Rockets first upon one side ( but so that the last Rocket be placed over the said hole ) and boring a small hole in one side of the last Rocket , put in a cotton wick for priming, letting it come through the hole in the Wheel, to the mouth of another Rocket which shall be turned the contrary way on the other side ; so that the wheel having finished its revolution one way may take fire on the other side, making  
a retrograde



a retrograde motion: but if you place the Rockets all one way on both sides, it will continue twice so long as another of the same bigness, the form of which is expressed in the Figures following.

D. Is the wheel with Rockets on one side, the last Rocket to have a vent to pass through to the other side.

E. Represents the said wheel finished, with Rockets on both sides.



16 The order to make a fixed wheel, standing upon a Post, giving divers reports.

**T**Here must be a wheel turned two foot wide, and out of the upper side must be a groof turned half an inch wide and half an inch deep, to which

which groof you must have a piece of wood so fitted, that it may just slide in, which piece of wood must have so many small holes bored in it as you will have reports about it, and be sure you set them not too near together, lest the fire of one beat the other down; having thus provided your wheel, you must make a conveyance or hollow Trunk of paper, which will just fill it, and fill the same with some of your slow mixtures of stars, and then putting on the cap of wood so fitted with holes, being made fast with gliew, pierce every hole into your hollow conveyance so that putting a quill into every one, they may take fire, and to the quill fasten a Report; so shall you have a peal of Chambers placed in a small room, which being once Fired, will follow in order, till the whole train be spent. Behold the Figure marked with A.



17 *Another fixed Wheel upon a post, which will cast forth many Rockets into the Air.*

**T**His Wheel is not much unlike the former, which will give Fire to divers Rockets standing circular, differing little from the former, only you must make a hole for every stick to pass thorow, as it is in the Figure B. and therefore it must be made somewhat broader, which will work the like effect that the other doth, by conveying Fire from one Rocket to another, till they be all spent.

The mixture for this conveyance must be very slow, therefore use these Ingredients: Take eight ounces of Roch peter, four ounces of Sulphur vive, half an ounce of Camphire, two ounces of fine Powder-dust, and meal these very fine, and mingle them together, adding half a quarter of an ounce of Linseed Oyl, and as much of the Oyl of Peter, these Oyles must be dropped in by degrees, and so wrought up, till you find your mixture bound like Dough, and this is both slow and sure.

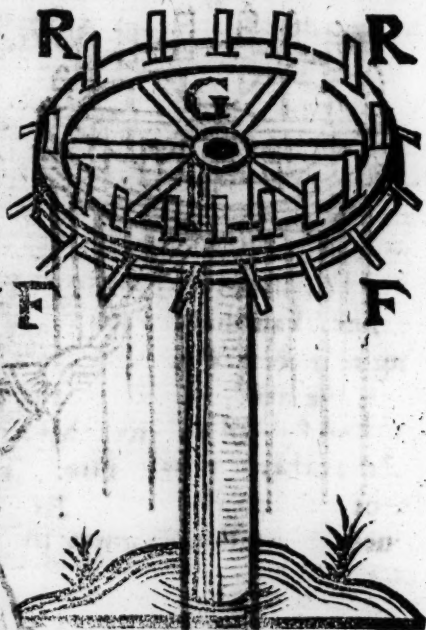
18 *Another*



18 *Another dainty fixed Wheel, which will cast forth  
divers Figs, or Serpents, and as many Reports.*

**Y**ou must have a Wheel turned with a groof on  
the top thereof to put in the conveyance of pa-  
per,

per, then fit on a piece of wood (as it was before shewed) with small holes to put in quills, which are for Firing your reports, and must be placed round about the upper part of your wheel, and on the side thereof divers holes must be made of the bigness of your Fisgigs, which must be pierced through to the paper conveyance, those Fisgigs that are placed round on the sides and the reports on the top one train will



Fire them all; and in firing you shall see all the Fisgigs flying round about, one after another as the fire passeth to them; and for every Fisgig which passeth out shall be fired a report; so that there shall be a continual motion, until the whole train be consumed.

G. Is the Wheel with reports and Fisgigs.

R R. Is the Reports on the upper part.

F F. Is the Fisgigs on the side of the Wheel.



*19 Of Night Combatants with Faulchions and  
Targetts, Clubs, Maces, &c.*

**T**His is performed by two men seeming to fight; or to make way in a throng of people; the Clubs at the great ends are made like a round basket (or other form) with wicker, or small sticks on a staff, which must be filled with Rockets in a spiral form glued, and so placed that they Fire but one after another: The Faulchions are made of wood in a bowing manner having large backs to receive many Rockets, the heads of one near the neck of another, glewed and fastned well together, so that one being spent, the other may take Fire: The Targetts are made of thin boards, which are channelled in spiral Lines to contain Primers to fire the Rockets one after another, which is all covered over with a thin covering of wood or past-board, bored with holes spiral also, which Rockets must be glewed and made fast to the place of the channels: Now if two men have in each hand a Target and a Faulchion, or a Mace of Fire, and seem to fight, it will appear very pleasant to the Spectators; for by the motion of fighting, the place will seem to be full of streams of fire: And there may be adjoynd to each Target a Sun or burning Comet, with Launces of each fire, wick will make them more beautiful and resplendent in that action.



20 *Another dainty one with Fisgigs, called Jack  
in a Box.*

**T**He manner of making the same is in this order,  
cause a box of Plate to be made about six inches  
deep, and of what compass you please (with a  
socket at the bottom to put in a staffe) then put-  
ting in a quantity of corn-powder, or powder-dust  
in the bottom of the box, you may fill it with  
Fisgigs or Serpents, leaving a place in the middle for  
a Cane to go through the bottom, which Cane must  
be filled with a slow receipt, in which you must put  
a quan-

a quantity of Camphir, but no Oyls, in regard of the narrow passage it hath to burn, without any other vent; then put your Cane down, leaving it an inch above the box, and take a thick piece of past-board cutting a hole for the Cane to pass through, and glew it close to the Cane that the Fire pass not through before its time: this past-board must be of sufficient breadth to cover the box quite over, then put it on a staffe and light your Cane which will appear only like a Candle, and after a little space of time you shall hear a sudden noyse, and see all those Fisgigs flying some one way, and some another: This hath given good content to the beholders, you may if you please make Clubs or Maces of the same.

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21 Of Pots of Fire for the ground, which will make the Air rebound with their reports.

**M**Any Pots being fired together, do give a fine representation and recreation to the Spectators; for those pots being filled with balls of fire, or flying Serpents for the air, will so intermix one within another in flying hie and there a little above the ground, and giving such a volly of reports, that the air will rebound with the noyse, and the whole place be filled with sundry streams of pleasant fire; which Serpents will much trouble those near the place to defend themselves in their upper parts; and they will be no less busied by the balls of fire which will seem to annoy their feet.



*22 The making of a Fire-ball for the ground, which  
will be in continual motion.*

**Y**OU must get a ball turned of some light wood, and then let it be sawn through the midft with a thin bow-saw, then make on each side a hollow groof to lay in two Rockets (joyned together after the manner of the Runners) and then close up your ball with glew; only in the place where the two Rockets joyn shall be a groof, which must be pasted over with paper, that the second Rocket taking fire may have a vent, otherwise the ball will serve but once, then fire it and you shall see the operation with pleasure.

23 *The making of a Ball for water which shall burn,  
with great violence.*

**S**OW a round Case of strong Canvas, in shape of the case for a Foot-ball, but somewhat lesser, and very round; having thus made your case, then proceed to the filling of it, which must be done in this manner: You must first put in three or four good spoonfull of your mixture following, and with a stick made round at one end, force it close together, and so continue filling it, and between every filling put in your stick, and force it together, round it continually in your hand till you have finished it; which having done, sew it up close, and then arm it with small cord, which is called marling; after you have thus done, you must coat it with a quantity of Rosin, Pitch and Tallow to dissolve, and dip your ball all over in the same, provided that you leave two vents to fire it, which must be pierced a third part into your ball, which must be stopped with two small sticks, till such time that you come to use them, the form thereof you shall see in the next figure by the Letter D, then pulling forth the sticks, fill the two vents with fine powder-dust, and firing it, cast it into the water, and you shall have your desire; but you must alwayes be sure that your ball be thoroughly fired before you cast it from you: The Receipt for this ball followeth.

Take one pound of Powder, eight ounces of

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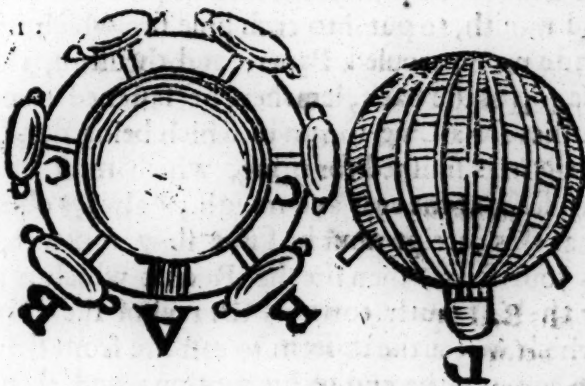
Roch-



Roch-water, four ounces of Sulphur, two ounces of Camphir, one ounce of oyl of Peter, one ounce of Linseed Oyl, half an ounce of Oyl of Spike, and two ounces of Colophonia.

24 *Another dainty Water-ball, which will shoot  
forth many Reports.*

**T**His Ball must be made of wood (as was shewed before) in two pieces, because you may joyn it close together at pleasure, having small holes bored round about it, to put in your quills which justify the Reports, which reports or breakers must be made of paper, choaked at both ends and primed through the midst; they must be fastened round with pitch, and so covered round about, that no water may pass in: you must fill this ball in two halves, that you may force it very close together, and when it's filled, glew it fast, and arm it well with nealed wyer, then put in your breakers, with a quill which must enter into the ball, and likewise into the breaker; the form whereof you may see in the Figure following: For A. is the mouth of the ball where it is to be fired, B. B. are the reports or breakers, being made of paper, and filled with Corn-powder: C. C. are the Quills, which must be filled with powder, dust, and serveth for firing the Reports.



The Receipt for this ball are these; Take one pound of Roch-peter, four ounces of powder-dust, three ounces of Sulphur-vive, two ounces of Camphyr, one ounce of Linseed-oyl, two ounces of Rosin, and one ounce of Oyl benedi&ct, you must powder those things which are to be powdred, and mingle them all together, and by little and little sprinkle your Oyls, till you have wrought it like Paste; and then use it: the quills must be filled only with powder-dust, because it must fire suddenly.

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25 *How to make a Dragon, or the like, to run on the Line, spitting of fire.*

**T**He body of the Dragon must be made either with Past-board, or with fine rods of wicker, being hollow, with a place in the belly to put in two Rockets, and must be so ordered, that there

H 4

● may

may come a small Pipe from the tayl of the one, to the head of the other: then make a place for the eyes, and mouth, to put into each hole fire, which must be made up in rouled Paper, and thrust in, then on the top of the back, let there be fastened two small Pullies for a Line to run in, which being done, your Dragon is finished for firing, which must be thus: first set it at the eyes and mouth, (always observing that this receipt must be some slow mixture, such as your stars) then fire that Rocket which is placed with his mouth towards the tayl of the Dragon, which will make it seem to cast fire from thence till he come to the end of his motion; and then on a sudden (as a creature wounded with some accident) shall return with fire coming forth of his belly: This being well ordered, will give good content to the beholders of the same: Behold the Figure.



26 *The manner and form to represent Saint George fighting with a Dragon in Fire, on the Line.*

**W**HEN you have formed your Figures of Past-board, or Wicker (as aforesaid) you must make a hollow trunk through the body of each Figure, for a great Line to pass through, and likewise for a smaller Line to draw them to and from each other, which must be fastned in this manner (as you may see in the Figure following:) At the breast of the Dragon let one end of one cord be tied, which must pass through the body of the George, and turning it about a Pulley at the other end, fasten it to the back of the George, and at the breast of the George let another cord be tyed, which must pass through the body of the Dragon (or a trunk on the back) and so returning about a Pulley at that end, must be pulled streight and fastned to the tayl of the Dragon, so that as you turn that Wheel the George and Dragon will run furiously at each other: and when you please, you may cause them to make a retreat, and come on again: but by all means forget not to scope your line extraordinary well, and likewise have a care that your work be not too heavy above line, but that they may hang in an equal ballance, otherwise they will turn their heels upward, which will be a great disgrace to the work and Work-man: And thus much to the ingenious I suppose will suffice: behold the Figure.



27 *How to make a Whale, a Mermaid, or other to play and swim upon the water.*

**Y**OU may make Figures of what shape your fancy best pleaseth: the body must be made of light wicker rods, and in the midst of the body let there be placed an axel-tree, having two Wheels coming into the water, yet so as they may not be seen: these Wheels must be made hollow, to contain a quantity of sand or water: the use of it is to keep the body of your Figure upright, and able to sink it so far into the water as is needfull, and likewise to make it swim to more steady: note that these Wheels must be loose, and the axle-tree fast: in the midst of this axle-tree, place three or four great Rockets one by another, with their mouths all one way: yet so provided that there may be such a distance between each Rocket that there may come a vent from the tayl of the first to the mouth of the second, and from the second to the third. And to the end that it may continue the longer motion, you may place divers lights about the body



Body, to make it the more beautiful; every of which lights extinguishing shall give a report, and so conclude. There are divers other fine Works to be performed on the waters, which a judicious Artift may invent.

The Letter B. represents the Mermaid.

C. is the Wheels on the axle-tree.

D. are the Rockets on the axle-tree.



28 Of divers other rare Works, which are to be performed on the water.

**T**Hose places which are situated upon Rivers or great Ponds, are proper to make these recreative Fires

Fires on ; therefore if you desire to make some of consequence, they ought to be built upon Boats, or light timber, which may be framed like Beasts, or Fishes (spitting of fire ; upon which may be built Castles, Pageants, Turrets, or other conceits as you please. As if you would present a Castle, out of which shall issue a Dragon, which shall swim through the water, and that Dragon be encountred by a horseman, which is thus performed. Cause a Castle to be framed ( as is shewed ) on light timber, and let the bottom of the door of the Castle with a ground plat be two foot under the brim of the water, ( the reasons follow ) and at a foot high within the Castle let there be a certain line tyed which may pass through the body of the Dragon, and may be fastened near the shoar, where must be a float sunk so far under water, that the line may not be perceived ; then fasten on your Dragon ( as was shewed before for the line ) but so that the head of this may alwayes be above the line, whereas the other was under, then at the appointed time, there must be one ready within the Castle, to fire those parts of the Dragon which is requisite ; which being done ( by the help of the pulleys ) shall pass it through the water, which so soon as it presents it self, Neptune on a Sea-horse shall come, and encounter the said Dragon, and at last shall overcome it : Or you may order the work so that which you please shall have the victory ; for that which keepeth fire longest, is supposed to have the best and that which is soonest spent, to have the worst.

G. representeth the Castle floating on the water, from whence issueth the Dragon.

E. is

**E.** is the Dragon coming forth of the Castle.

**D.** is Neptune riding on the Sea-horse, coming to encounter the Dragon.

**F.** is the Pully that causeth these motions by the Line, to be pulled to and fro.



You may if you please, build upon Boats, or Timber, Turrets, Pageants, or Castles, as is said, to receive or hold diversity of Fire-works that may be made within them, which may play out, and play divers Fires, as Reports, Stars, Golden Rain, Fisgigs, Granadoes, and Balls of Fire to burn in the water, which will give great content to the eyes of the beholders; and in the conclusion, it may be so ordered, that they may fire one another, for which end they were made.

29 *The manner to compose a Ship of Fire-works, which being once fired, divers motions will present themselves.*

**Y**Ou must make a mould or body of a Ship to be made, that you may take off the upper deck, to place some works underneath, where you must have a fire-wheel placed with a screw on the Axle-tree; this Wheel must be placed in the stern, and must turn a rouler, on which must be two-girts placed, that must pass on each side of the main mast, and run on to the foreship; in this Wheel there must be a hollow spoke and axle-tree, as I have shewed, which must be so ordered, that the Wheel being spent, it may convey fire to a tire of Guns, lying round about, which must be fired with a close conveyance; and having passed that, it must take hold of another conveyance which shall give fire to certain Rockets, which must be placed in the body of some figures representing mariners, and must be so fitted, that they may have a Cane joyned to their body to guide them, that they may run on the ropes from the Deck to the top of the masts. This and other the like may be performed with great facility; the form of which followeth.

B. The Fire-wheel which moveth the Rouler, and carrieth the girt whereon the Figures are placed.

C. The Figures placed on the girt being in motion.

E E. The Figures which stand ready to run up the cords, some half way, some at top.



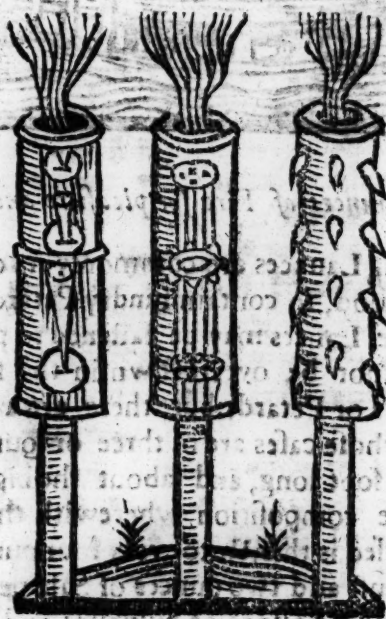
30. *Of Launces of Fire for pleasure and for service.*

**S**Tanding Launces are commonly made with hollow wood, to contain sundry Petards or Rockets ; these Launces may be fastened to posts, so that they may not be overthrown in the flying out of the Rocks or Petards: but there are a lesser sort of Launces, whose cases are of three or four foldings of paper of a foot long, and about the bigness of ones finger: the composition wherewith these Launces must be filled is this; Unto every four ounces of powder you must add two ounces of Salt-peter, and unto that add one ounce of Sulphur; and then it will make a brick fire red colour before it be half spent, if  
the



the Launce be fired and held to it : Now if twenty such Launces were placed about a great Rocket, and shot to a house or ship, it would produce a mischievous effect.

Or, if unto the end of the Rocket there were fastened an arrow (which must not be too heavy) and instead of the feathers, it should be of thin white tin plate, and if you give fire to it being thus prepared, you may see how serviceable it will prove. To the head of such Rockets may be placed Petards, balls of Fire, Granadoes, and the like, and so may be applied to warlike affairs.



**Here**



Here followeth Necessary and  
serviceable Fire-works both for  
Land and Sea Execution, and  
first for the Pike.

**H**AVING treated of Recreative Fire-works, I hold it convenient to speak something in brief concerning works for Service (necessary for these times) both for Land and Sea; which may thus be performed.

If you would make good a Breach, or enter a Ship, then take strong Canvas, being cut, sewed, and tyed hard on a Pike with Marlin-cord, then with this Receipt following, being compounded and wrought together, do thus.

Take Roch-water one part, and Peter in meal, as much Sulphur mealed two parts, three parts of Rosen in roch, Turpentine one part, as much of Linseed-Oyl, one half part of Verdegrease, Bole-armoniack, Bay-salt, Colophonia, of these three one third part, and if you think fitting, half a part of Arsnick: Then coat the same over with this liquid mixture melted in a pan or pot: Take four parts

I

of



of Pitch, one part of Linseed-oyl, one third part of Turpentine, Sulphur one part, Tar one third part, and one part of Tallow. After these are melted, and being cold, bore two holes in each of the same an inch deep with a sharp Bodkin or Iron, filling the same with fine bruised Powder, and put in each hole a little stick of two or three inches long, to be taken out when you would fire the same : ( This composition will burn furiously. ) If you please, you may fasten to the same receipt on your Pike, divers light Pipes or Canes of Iron, or Brasse of six or seven inches long, being Pistoll or Caliver bore ( as the Figure marked with B. sheweth ) placing the touch-hole thereof close to the Canvas, boring the said Canvas through, and priming the same with fine powder, pasting a Paper thereon, and then coat the same over as before said ; This being charged with powder and bullet, will do great execution in a throng, either defensive or offensive.

*How*

*How to arm a Dart or Javelin with Wild-fire, for the  
Sayls or sides of Ships.*

**Y**OU may, arm a Dart, Javelin, Partizan, or suchlike weapon to do excellent service, being in the hand of a valiant Souldier, as you may see by the Letter C. in the same: The same should be filled with the selflike Receipt, as before is shewed for the Pikes with Wild-fire, which will be a very good weapon for to go into the sides or sails of Ships.

Or you may place upon the staffe of your Javelin certain Pistol barrels of one length, about ten or twelve inches, letting the same into the wood round about the staffe a little, as a Pistol barrel is into the stock ( as the Figure marked with the letter D. sheweth ) which staffe should have so much substance at the one end, whereto you may nail the same barrels fast at the breech; and about the midst of the same put over a hoop of Iron, as close as ever you can, the which is to be charged in this manner following, viz. First charge every barrel with two inches of powder, after put in a bullet a little lower than the bore of the same piece; then take of this slow Receipt following.

Of bruised Powder four parts, of Salt-peter in meal, Linseed Oyl, Brimstone finely beaten, Varnish, and of Willow or hazel cole moistned with a little Vinegar: ( of all these five last Ingredients one Part; ) which must be well wrought together with the hand in some wooden Vessel, till you feel that

it will cling together, of which you must put in after the bullet two inches, and thrust the same together with a Rammer stick; and then again put in two inches of Powder, and after that a bullet; and lastly, two inches of this slow Receipt, untill you have filled every one of the said barrels within half an inch of the mouth, the which is to be filled up with the said slow Receipt, and powder bruised and mixed together, that it may the sooner fire: This being done, bind a paper over the mouths of the same, untill you will use them; and giving fire to any one of the same, it will fire all the other, and every one will discharge three or four shots a piece one after another, to the hurt of the enemy, being used in service either to offend or defend; to the pleasure of the beholders, being used in triumph with bullets of Receipt rolled in tow, and coated with brimstone.



*How*



*How to enter up a pair of stairs, or to defend ones self, being in a narrow Room.*

**I**F you are streightned up in a narrow Room, to defend your self, or would enter up a pair of stairs, where you cannot use a long weapon, you may make a Logget, whole staffe shall be but three or four foot long, arming the same with the same Receipt as was shewed to arm the pikes, whereon you may place certain pipes of Brass or Iron, charged as before is taught : And if you please, you may put into the end of the staffe, a Rapier blade with a skrew, to take off and on at your pleasure, as the Figure marked with the Letter E. sheweth



*How to defend a Breach, in a Ship or other place of defence.*

**T**O perform this, you may arm a Partezan Javelin, or Fork with Firework, and to shoot  
I 3 ever

every one of them with seven or eight pistol or musket bullets in nailing a plate of Iron cross the pike or point of the said Javelin, or between the grains of the tork, piercing certain holes through the same, unto which with a strong wyer, you may make fast on either side so many pipes of Iron, of



seven or eight inches long, as you think convenient to fix upon either or any of the said weapons, and charging the same with powder, bullet and wad, you may cause the same to fire one after another, in filling a roule of Canvas sewed together, (as the figure F. sheweth,) with slow Receipt, and coated, as before is shewed :

And this being plac-

ed artificially upon the short barrels or pipes (as the Ggure G H. sheweth) and primed with fine powder directly against the Touch holes of the barrels, passing a little paper over the same, firing the said trains at both the ends, which as they burn, shall still discharge the short pieces one after another, to the great hurt of the Adversary.

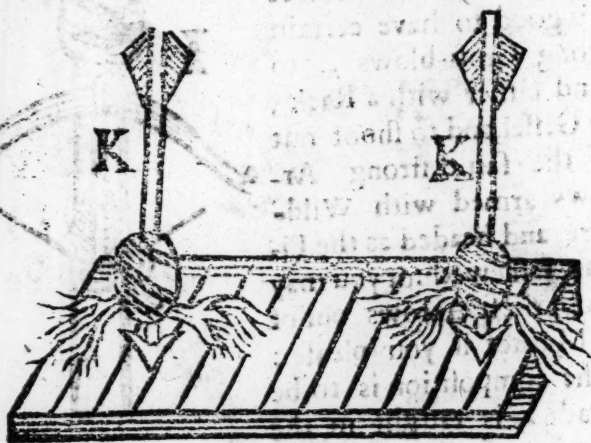
*How to shoot Arrows of Wild-fire out of a  
Cross-bow.*

**T**His is an excellent way to fire the Sails of Ships, thatched Houses, Stacks of corn, or Hay, or any such combustible matter apt to burn, which may be done at a pretty distance off, when you cannot conveniently come near the same: Therefore it is good to have certain strong Cross-blows, to bend either with a Rack, or Gessel, and to shoot out of the same strong Arrows armed with Wild-Fire, and headed as the Figure I. sheweth: or you may shoot these Arrows out of a Musket if you please: The composition is to be made as is taught in the arming of pikes with Fire-works, which Arrows may do great good for divers other services.



*How to burn Wooden Bridges, Gates,  
Houses, &c,*

**T**O perform this and the like military Services, if you can, come to anoint the same with some such liquid composition as is before shewed for the coating of Fire-works, melting in the same a good quantity of bruised brimstone, and sticking in the same arrows of Wild-fire, made in pro-

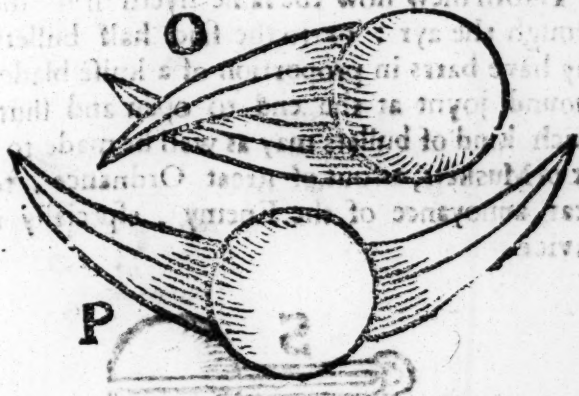


portion, as the Figure K doth shew. The Receipts may be made as the former for Pikes, with Wild-fire, which will certainly set the same on fire, for the Receipt is so forcible that it will burn in the water,

*How*

*How to cut the Cables, or the Shrouds of Ships,  
at a good distance.*

**F**OR Sea-service there is devised out of great Ordnance to shoot certain bullets that shall open and shut with a joynt in the head like a pair of Compasses, the arms or legs whereof are made in proportion like to the blade of a knife taper-wise, and bowing sharp towards the point; as the Figure sheweth marked with the Letter O, and how the same is to be put into the Piece after the powder



and Wad; and the other figure marked with the Letter P, doth shew how the same being in its violent motion, flyeth open through the Air like a Sithe, cutting the Cables, Shrouds, or any thing in its way, being shot out of any piece of great Ordnance,

*Other*



*Other Devices for the cutting of Shrouds or the like.*

**F**OR to cut the Tackle or Shrouds of ships, it is good to cast half bullets of Iron, or lead, unto every of which make fast a barr of Iron, wrought either three or four square, about the bigness of a mans finger, and cut some fourteen or sixteen inches long, with a loop at the end, unto which a Ring of Iron is to be put, that the same may close and shut as the Figure with the letter S. sheweth; which sheweth also how you must put the same into the Piece; and the other figure with the letter T. doth shew how the same flyeth in its moving through the ayr: or to the said half bullets you may have barrs in proportion of a knife blade, with a round joynt at the end to open and shut, the which kind of bullets may as well be made to shoot out of Muskets, as out of great Ordnance, to the great annoyance of the Enemy, especially in Sea Service.

*Another*

*Another for the same.*

**A**lso to cut the Tackle of Ships, or to do many other good services, either with musket or great Ordnance, it is good to chain two bullets together as the Figure Y. sheweth.

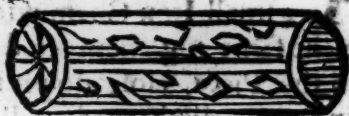
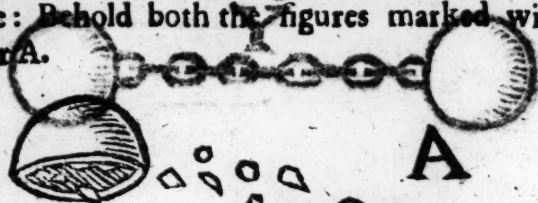
*Another.*

**A**lso for the like purpose aforesaid, if you take a small Iron Chain with good Links, rolling the same together round, that it may go easily into the Piece, close down to the wad, the same being again discharged, will spread it self in length and do good execution.

*How to do excellent Service against an enemy who would enter a Breach, a Gate, a Bridge, a Ship, &c.*

**I**F that the Enemy will enter ( and that you intend not to yield ) it is necessary to have in readiness

dineſs divers hollow bullets made of two plates of iron, or other mettall, ſo that the one may cloſe about the other round like a box, which being filled with pebble ſtones, ſquare pieces of iron, called Dice-ſhot, muſket bullets or the like, which being diſcharged out of a murdering Piece, it will do great execution: if you will fill caſes of wood, made like unto a Lanthorn with the ſame ſtuff, it will perform the like ſervice being ſhot out of a Murdering piece: Behold both the figures marked with the letter A.



*How to prevent a train of Powder laid to blow you up before you enter a Ship, or other place.*

**I**F you imagine that there is ſome train laid to blow you up (as it often happeneth) you may prevent the ſame, by waſhing certain Purſes of Canvas, filled half full of good corn-powder, and with eight or ten fiery bullets of an inch, or an inch and half

half in height; and filling the other part of the Purse with slow Receipt, you may when you think good (the Receipt being well fired) throw the same from you, which will burst in pieces after the lighting on the ground, and disperse the said inclosed bullets here and there, which bullets will burn furiously, and if there be any train of powder laid near, it will presently fire the same. The said purses are very good to throw out of hand, or may be shot out of a Morter-piece amongst men in battle-array, to disorder them, or into a Town; the Figure B sheweth how to fill the purses, and the Letter C. sheweth the proportion of it, being made up, filled and coated over.

The receipt for making these bullets of Wilde-fire following: Take of Sulphur in meal six parts, of Rosin in meal three parts, melting the same in some pot or pan over a slow fire; then take of Stone-pitch one part, of hard Wax one pound, of Tar one fourth part, of Aqua-vitæ one half-part, of Linseed-oyl as much, of Verdegrease one fourth part, and of Camphir one eighth part, melting all these together likewise, and stir into the same two parts of Peter in meal; and taking the same from the fire put therein four parts of bruised powder, working the same well together in your hands, and roul the same round of the bigness that you would have your balls of, boring two holes through the same a-crofs, which when you would use, must be primed full of bruised Powder; these balls will be as hard as stone, and needeth no coating, and being fired will burn furiously, and cleave to any thing.

thing, not diminishing in quantity being burned to ashes, which ashes will kindle an Oaken board: If you please, you may shoot these bullets out of a Piece of great Ordnance. The Figures for the Purfes here follow.

**B****C****Short**





Short, but certain Rules for the making all sorts of Fire-works for recreation, as Rockets, Fisgigs, Runners on the Line, Serpents, Stars, Fire-wheels, Clubs, Jack in a Box, &c. Together with the quantity of all the ingredients thereunto belonging, and the manner of compounding them.

*How to compose a Castle of Fire-works with small charge, that in the firing will yield as much variety, and give as much content as any: Now published for the benefit of young Practitioners. By W. R.*

**I**N all things actual, a certain method is requisite to be observed. Therefore, such as intend to put in Practice these ensuing Instructions, are first to provide themselves of such Rocket Moulds as are suitable to the work they undertake. The description and proportion of them, I conceive somewhat needless, in regard any one may in Crooked Lane, London, be furnished with what sizes they please. This being premised, I shall begin with

*Fisgigs, by many called Serpents.*

**T**HE best way of making them is thus: having provided a small mould without a Needle, take

make a Coffin of paper fit for it, which choak half an inch from the end; then put it in your mould, and fill up three inches with powder-dust only, finely beaten and sifted, then choak it again, and afterwards fill it about an inch with corn powder, then choak it close, and your Fisgig is prepared. To use these on the tops of great Rockets, put into the mouths of them some of the Composition for Stars, which will shew very delectable to the spectators; for after they have continued a good space in the form and manner of Stars, they will then riggle to and fro, like so many flying Serpents: Of these Fisgigs most sortsof Fire-works are composed. When you can perfectly make these, you may then proceed to the making

*Runners on a line.*

**A**ND for them is likewise requisite a Mould, five inches long without a Needle: first make your Coffin of paper, choak it at the end as before, then put it in your mould, and fill it four inches with Powder-dust: (Note that in the filling it you must put in but a little at a time, and ramm it down close and so of all others.) Then choak it, and fill the rest of it with corn Powder (to give a report) leaving only so much of the Coffin void as will serve to choak it. This being done tye it to a hollow Cane three inches long; so as in tying of it you do not bruise the Rocket. And so have you a single Runner for the Line finished.

If you desire to have a double one to run forwards, and back again, you must then be provided of two

Run-

Runners made after the manner of the former, only one to be an inch longer than the other: And to finish these, use this method. First tye the long Rocket to the Cane, and at the mouth of it fasten the breech of the short one, by rousing over them a little piece of paper, with some powder-dust in it to give fire to the long one, not forgetting to make a small hole in the breech of the short one with a bodkin, that so the long one may take fire: having done so, then turn back the short Rocket so, that the mouth of it may reach somewhat further than the breech of the long one; lest in firing it you accidentally fire both, and by that means spoil your Runners; The best way of tying the double ones is to fasten the short one so, as the long one may be betwixt it and the Cane; for by that means it will run without swagging; whereas, if they be both joyned to the Cane, as Mr. Bates and some others direct, it is both unsafe, and uncertain; unsafe in this, in case the first accidentally break, the other with the force of it will be struck off; and uncertain it is likewise, in regard after the first Rocket is spent, the Casing of it coming back will swag and retard the passage of the other, and by that means endanger burning of the Line. Let your Line be well rubbed with soap; which will both secure it from fire and facilitate the passage of the runner: likewise for these and all other, let your Powder-dust be beaten, and sifted very small, for the least corns in it may danger the breaking.

*How to compose a Wheel.*

**F**irst provide a Wheel, either round or square, the better sort are 8 square, made fit to the length of the Rocket, five inches each, the best proportion is about sixteen inches diameter. Now having provided a Wheel, take so many Rockets, made after the same manner as those are which run on the line, which you must fasten together, by joining the mouth of the one to the breech of the other, in the same manner as those for the line; in the tying them on, have a care you do not bruise them, and be sure to leave some space betwixt the mouth of the first and the breech of the last, that so by firing the first the last may not take, and by that means breed a confusion.

You may order these Wheels to burn either Horizontal or Vertical; for the Horizontal provide a post or staff, with a pin on the top of it to put the wheel on; if vertical, then provide a pin fastened to the side.

*How to make a Club, to cast forth divers Fishgigs.*

**T**O do this, first cause a piece of wood to be turned four inches diameter, let it be bored with an Augur of an inch and half bore from the top towards the bottom, leaving the bottom somewhat above an inch thick, and a place underneath to fasten a staff in; the length of it may be about eighteen inches: then draw a line spiral wayes about it from the bottom to the top in manner of a screw, each line

line an inch and half asunder, in that line bore small holes an inch asunder within half an inch of the bottom, and then pierce it through with a Piercer; let your holes be of that bigness fit to contain a Fisgig, and make them somewhat slope-ways, that so the Fisgigs may stand fast, though slack, otherwise they will not come easily forth.

Load your Club or Trunk with the composition following, and then put in your Fisgig made as before, priming each of them, and likewise each hole with powder-dust, then fire your Club at the top, and they will fire one after another, and fly about in a confused manner.

*The Composition for this Club is.*

Roch Peter eight ounces, Sulphur vivum four ounces, powder dust two ounces, Camphire one ounce, Linseed oyl half an ounce, beat and mix these according to the order prescribed in the compositions following.

*To make Rockets for the Air:*

**P**ROvide first a good mould of what size you please, with a Needle in it, and a Rowler with two Rammers, the one hollow for the Needle and the other sad, to ram it after the Needle is covered. Having made a good strong Coffin of paper fit for the mould, and choaked as before, then fill it with the composition for that size your Rocket is of, the several proportions and mixtures hereafter follow. To fill it, take a little tin scope, and put in about the twentieth part of the quantity it holds, and then ram it with your hollow Ram-



mer, and so continue till you have filled it to the top of the Needle, alwayes beating it down with two or three good strokes of a mallet, then fill in more almost to the top of the Mould ramming it as before, but with your sad rammer, leaving only so much unfilled as that you may double down some of the paper and ram it close, making a little hole with a bodkin to give fire to some corn powder ( to give a report ) put within that Paper as is left unfolded down, and then choak it, next prime it, as shall be shewn hereafter, and then proceed to heading of it, which you may do several wayes, either with Stars, Serpents, Crackers, or golden Rain: the composition for the making these hereafter follows. To place these on the Rocket, first make a thin Coffin of paper, the inside of it somewhat wider than the outside of the Rocket, which you may fit by rousing it on the outside of the mould, and fitting it to the Rocket, then fasten it to the top of the Rocket, and strew a little powder in it, having first made a small hole in the top of the Rocket to give fire to it: in this Coffin you may place short Serpents with the mouths downward made as before, or with Stars only, Crackers or golden Rain; having done this, take a piece of thin pastbord, and with a pair of Compasses make a round circle in it, then divide it in two, and with the one half make a cap taper-wise, fit to cover the head, and with gliew fasten it to it: then provide a dry Olier stick about eight times the length of the Rocket, straight and flatted at the end, to this fasten the Rocket, tyed at both ends just in the choaking place, that so you may not loosen the

composition within, then poise the stick, by balancing it on your finger three or four inches from the mouth of the Rocket.

*The Ingredients for Rockets for the Air of all sizes.*

**F**OR Rockets which contain from one ounce to four, to one pound of powder-dust, put two ounces of Charcole dust: for Rockets which hold from five ounces to ten, to one pound of powder, put two ounces and a half of charchoal dust: and for Rockets which hold from ten to sixteen ounces, to one pound of powder put three ounces of charcoal dust; but be sure that both your powder-dust in this and all other be well beaten, and finely sifted, as likewise your coal dust. If by trying your composition you find it too strong, you may mend it by adding a small quantity of coal dust to it: if too weak, then by adding a little powder-dust. My advice is, to mix a pretty quantity together, that so by the tryal of one Rocket you may be ascertained of the rest; for all powder is not of one and the same strength.

*Priming for Rockets.*

**T**AKE Cotten wick (such as the Chandlers use) and soak it in oyl of Camphire, then take it out and roul it in powder-dust, then dry it, and keep it close, otherwise the strength of the camphire will decay. The composition for Stars will likewise fire them.

*Composition for Stars, and first for those of a blew  
and red colour.*

**P**owder mealed fine four ounces, Salt-peter two ounces, Sulphur vivum six ounces, beat these very fine, and then mix them, adding thereto one ounce of Aqua-vinæ, and a quarter of an ounce of oyl of Spike. To make thele up for use, Take a rouser about the bigness of an arrow, and roul paper on it, and paste it close, then fill it with the composition before prescribed, and beat it hard, then cut it into short pieces half an inch in length, dipping one end in glew, and strewing the other with powder dust, it is then finished, only let it be dry before you use it.

*A Composition of Stars of a very beautiful colour, the easiest, best and surest way, never till now made publick by any.*

**S**alt-peter one ounce Sulphur vivum one ounce, powder-dust one ounce, Camphire a quarter of an ounce, beat these very fine and mix them, afterwards make paste of them with the oyl of Turpentine, and then make up little pieces about the bigness of a Pease, which roul in powder-dust, and let it dry. Of this sort you may put two or three dozen at the head of an ordinary Rocket, the charge and trouble of making is far less than any other way.

*To make golden Rain.*

**D**rovide your self of a good quantity of Goose Quils, cut them off at the end next the feathers, then

### *Artificial Fire-works.*

then fill the quills with the following composition, and they will make a very glorious shew. To one quarter of a pound of powder-dust add half an ounce of coal dust, and for use put the open end of the quill downwards.

### *To make a Jack in a Box.*

**P**rovide a tin box six inches deep, with a socket made under the bottom of it to place it on a staff, let it be of what bigness you please, in the bottom of it strew some corn powder almost half an inch thick, then fill it with Serpents, or Fishgigs placed with the mouths downward, leaving a place in the midst for a cane to pass through, which fill with a slow composition; ( that for Stars, or these following are very good ) then put in the cane, and fasten a cover of pasteboard very close over the box, that so it may not fire before its appointed time.

### *A composition that burns with a flame slow and sure.*

**R**och peter four ounces, Sulphur vivum two ounces, Camphire one quarter of an ounce, powder-dust one ounce. Meal these very fine and mix them, adding thereto one quarter of an ounce of Linseed oyl, and a quarter of an ounce of oyl of peter dropped in by degrees, and so wrought to a paste. To treat your Camphire, dip the peltle in oyl of Almonds.

### *Another sort of mixture that burns sparkling.*

**P**owder-dust four ounces, Coal-dust two ounces, this rammed close in a Cane, renders the light very delectable to the spectators.

*A composition for a white fire, that lasteth long.*

**S**A't-peter eight ounces, Powder-dust two ounces, Sulphur vivum four ounces, Oyl of Peter one ounce, Camphire half an ounce; meal those which are to be mealed, and incorporate them together.

*How to compose a Castle of Fire-works with small charge, that in the firing shall yield as much variety, and give as much content as any.*

**F**irst provide an indifferent large frame of wood, four square, with little round Towers of Past-board at the Corners, the best size is 18 inches square, and twelve inches high, let the bottom be made firm to stand on any place, and the sides with gates, (as your fancy shall direct) then fasten on the inside three ledges of wood on each side about, each ledge with a groof made on the top of it, then make so many holes in the frame of wood, suitable to the ledges, as you intend to have the Castle give reports: you may easily make eight to each ledge, which contains 96 reports, you may add more as you see cause; or at the top fasten many Crackers, which at the end will fire like a volley of shot: the manner of making these reports shall be shewed hereafter; and to place them, first prime your groof with a slow composition, and from the uppermost Row to the second put a wick, primed, as for Rockets, and so from the second Row

to



to the third, leaving some hanging forth at the door to fire it, then put in your Reports the mouths inward, fix them to your grooves and cover it close, afterward fit a board four square to cover the top of the Castle, of each side half an inch broader than the Castle: on the four edges of it you may fasten Pastboard cut stone-work wayes in manner of a battlement, and at each corner, place a small jack in a box with a long Cane in each of them, filled with slow composition, made as before; which Canes let be of the largeness as may burn all the time the Castle is firing: in the midst of the board on the top, place a pin to put a wheel on, made of thin Deal board, five, six or eight inches square, proportionable to the length of the Rockers, which fasten to the board by making holes in it, to tye them to it: on the top of this Wheel you may fasten little statues of Babies, as Souldiers, Drummers, or the like: and as the Wheel turns, they will move about like Anticks, with much delight to the Spectators: And so have you finished your Castle. To fire it, first Fire the four Canes in the four Boxes at the corners, then fire the Wheel at the top, and lastly, fire the cotten wick at the Gate, and so the reports will by degrees fire upwards, and in the end conclude with a volley of shot. If it be exactly made, it will continue a long space with abundance of delight.

*How to make Reports for a Castle.*

**F**irst make a C coffin of paper choaked as before, of what size you please, then fill it about an  
i nch

inch and a half with corn powder, ramming it close; and at the end ram in a piece of paper as you do to a musket, leaving the mouth open, and then it is finished: When you use them, prime the mouth of it but a little.

*How to make Rockets for the Ground.*

**F**irst, provide a Rocket ( ready finished ) as for the fire, then put the breech of it into a bladder, blow the bladder up, and then fasten it at the choaking place, by tying it close: when you fire it, throw it from you, and the force of it when it comes to the ground will make it rebound, and so be in a continual agitation.

*An almanack whereby to find the dayes of the Month this present year 1653. Which with the transposition of the moneths yearly, will serve for ever. Note, that the year begins at March.*

						12 February
6 August	3 May	11 January	2 April	7 September	4 June	1 March
		8 October	5 July	10 December		9 November
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Thirty dayes hath *September*,  
*April*, *June* and *November*.  
*February* hath eight and twenty alone,  
 All the rest have thirty and one.

*An explanation of the foregoing Table.*

Note that where the months end, you must then begin at the first figure of the Table, and that every leap year *February* hath 29 dayes.

*To find the day of the month by the foregoing Table.*

**O**bserve that the Mondayes that happen in each Month, will fall upon those dayes of the Month that are expressed in the same Column underneath it. As for instance, the Mondayes in *August* are on the 1, 8, 15, 22, 29. dayes of it; those in *September* and *December* are on the 3, 12, 19, 26. dayes, and so of the rest. Now by this to find the day of the month you desire, first find the Month, and under it that Monday of the month last past, and then you may easily know it : As for example, if you desire to know what day of the month the first Sunday in *May* will be : First find *May*, under it you will see a Figure of 2, being the first Monday, then reckon Tuesday 3, Wednesday 4, Thursday 5, Fryday 6, and Saturday 7. and so of the rest. Again, if you would know what day of the week the 18 of *November* will be, look under *November*, and you shall find the Monday next before it to be the 14, then reckon Tuesday 15, Wednesday 16, Thursday 17, and Friday 18. and so of the rest.

F I N I S.



## Necessary Directions for Drawing and Painting.

*How to take the perfect draught of any printed, or  
painted Picture.*

**T**AKE a sheet of *Venice* paper, or else of the finest white paper that you can get: wet it all over with clean Sallet-oyl, then wipe the oyl off from the paper as clean as you can, so that the paper may be dry, otherwise it will spoil a printed picture by the soaking through of the oyl: Having thus prepared your paper, lay it upon any painted or printed picture, and you shall see the picture through the same more perfectly appearing than through glass, and so with a black Lead Pen, you may draw it over with ease and better, first with a soft Charcoal, and then with a pen. After that you have thus drawn the picture upon the oyled paper, put it upon a sheet of clean white Paper, and with a little stick pointed, or (which is better) with a feather taken out of a Swallowes wing, draw over the Picture again, and so you shall have the same very prettily and neatly drawn upon the white paper, which you may set out with Colours, as shall be taught hereafter.

*Ans-*

*Another way.*

Having drawn the picture, ( first open the oyled paper ) put it upon a sheet of clean white paper, and prick over the same drawing with a good big pin, then from the clean sheet that is pricked, pounce it upon another; that is take some small cool, powder it fine, and wrap it in a piece of Tiffany or such like, and bind it up therein loosely, and clap it lightly over all the pricked lines by little and little, and afterwards draw it over again with a pen or pencil, or otherwise as you please.

*Another way.*

Take a sheet of thin white paper, and rub it all over one side with black Lead, or else with Vermilion tempered with a little fresh Butter; then lay the coloured side upon a sheet of clean paper; then lay the Picture you would copy out, upon the other side of the coloured paper, and with a small pointed stick, or with a Swallow's feather, go over all the strokes of your picture that you desire, and then you shall have all the strokes drawn very prettily on your white paper.

*Another way.*

Take a piece of clear Lantern-horn, and lay it upon your picture; then with a pen made of a Ravens quill, draw the strokes of your picture upon the horn, and when it is dry, breath upon the horn twice or thrice, and press it hard upon a piece of  
clean



clean white paper a little wetted, and the Picture that you drew upon the horn will cleave fast upon the paper.

*Another way.*

Take a sheet of white paper, rub it all over with fresh butter, and dry it by the fire; then rub one side of it all over with Lamp black-lake, or any other colour finely ground; lay this paper upon a sheet of clean paper with the coloured side downwards, and upon it lay the picture you would copy out, and trace the strokes over with a feather of a Swallow's wings, and you shall have your desire.

*Another way very pretty and easie to be performed.*

Take some Lake and grind it fine, then temper it with Linseed oyl, and afterwards with a pen draw with this mixture (instead of ink) all the out-strokes of any printed picture, also the muscles, then wet the contrary side of the picture, and press it hard upon a sheet of clean paper, and it will leave behind it all the strokes of the said picture that you drew over.

*Another way much like the former.*

Take Printers blacking, grind it fine, and temper it with fair water, and with a pen dipt therein, draw over the master strokes and out-lines of the Muscles: wet then a fair paper with a sponge, and clap the picture upon it, pressing it very hard thereupon, and you shall find the strokes you drew, left upon the fair paper.



## Of Painting.


*Of washing Maps, and other printed Pictures.*

**W**ashing Pictures is nothing else but the setting of them out with Water-colours; and for the effecting hereof you must be provided with store of Pencils, some smaller than other, also with Allum-water, Lime-water, Gum-water, water made of Sope-ashes, Size, Varnish, and store of good Colours well prepared.

*How to make Allum-water.*

**T**ake a Quart of Water and boile it with a quarter of a pound of Allum, sceth it untill it be molten, and let it then stand a day; with this water you must wet over your pictures that you intend to colour, for it will keep the Colours from sinking into the Paper, also it will add a lustre unto the Colours, that is, make them to shew fairer, and it will also make them continue longer without fading; some Paper will need to be wetted four or five times. You must let the Paper dry of it self after you have once wetted it, before you either lye on your Colours, or before you wet it again, if so be it need a second or more wettings.

YOH

 *How*

*How to make Gum water.*

**T**AKE clean water, and put into it of Gum Arabick a little, and let it stand untill the Gum be dissolved. Now you must have a care that it be neither too thick by reason of the Gum, nor yet too thin: for with the one you cannot work well, and the other will not bind fast enough; with this water you must temper your Colours before you lay them on your Picture.

*How to make Lime water.*

**T**AKE unslaked Lime and cover it with water an inch thick, and let it stand so one night, in the morning pour off the clear water, and reserve it in a clean thing for your use; with this water you must temper your sap-green, when you would have a blew colour of it.

*How to make water of Sope-ashes.*

**S**TEEP Sope-ashes a night in Rain water, in the morning pour off the clearest: this water is to temper your Brasil with.

*How to make Size.*

**T**AKE a quantity of Glew, and let it steep a night in water to make it the readier to melt in the morning; then set it on a coal of fire to melt, which done (to try whether it be neither too stiff,

nor

nor too weak, for the meanest is best) take a spoonfull thereof, and set it in the air to cool, or fill a muscle-shell with it, and let it swim in cold water to cool the sooner: If it be too stiff when it is cold put more water unto it, if too weak then put more Glew unto it, and when you will occupy it, make it lukewarm, and so use it: this is to wet your cloaths in if you intend to paste your Map or Pictures upon cloath.

*How to prepare your Colours.*

**S**uch as have need of grinding, you must first grinde them with fair water, and then put them upon smooth chalk-stone, and let them dry: then grinde them again with Gum-water, and reserve them in muscle-shells for your use.

Choose to lay on the thinnest and most transparent colours, especially if it be good work that you are to colour, so the one will set out the other; but if the work be none of the best, then endeavour to hide the imperfections thereof by laying your colours the thicker on it.

*A Sea-colour.*

Take Privet-berries when the Sun entreth into *Libra*, about the thirteenth of *September*, dry them in the Sun; then bruise them, and steep them in Allum-water, and strain them into an earthen Porringer that is glazed: or you may use them before you dry them, for the drying of them is to make them keep long.

*Another.*

Take blew Inde and steep it in water, and put to it a little Verditer.

*L*

*A yellow*

*A yellow colour.*

Take yellow berries and bruise them a little, and steep them a quarter of an hour in Alum-water, then strain them if you will, or let them stand in the liquor, and work therewith.

*A Russet colour.*

Take the fattest Soot you can get, and put it into a pot of clear water, so that it be covered two or three fingers and let it seeth well, which done, strain it through a cloath and set it on the fire again to thicken (but take heed you set it not on too hot a fire, for fear of burning it) so let it boill gently untill it be as thick as you would have it.

*Colour for Faces.*

First, lay upon the cheeks little spots of Lake or red Lead, then come all over it with white, and a little Lake; shadow it with Lamp-black or Umber, and white Lead.

*Hair Colour.*

Take number of Spanish brown, grinde it and temper it with Gum-water.

*Colours for naked Pictures.*

Take white Lead and a little Vermilion, temper them and lay them on, shadow it with Bole-armo-niack in the middle, and adde a little Soot to the utmost or double hatches.

*A Colour for dead Corps.*

Orange white Lead with a little of the water of yellow



*Necessary Directions for Paining.* 147.

yellow berries, and wash the picture all over, then change it with blew Inde, and shadow it with blew Inde, and shadow it in the single hatches and leanest places: then take Soot, yellow berries and white Lead, and with that shadow the darkeſt places.

*A blood-red colour.*

Sinaper, Lake, and Vermillion make a good blood red: ſome have commended Mutton blood very highly, but I never tried it.

*How to make Mutton-blood-red.*

Take ſome of the cleareſt blood of a Sheep, and put it in a bladder, and with a needle prick holes in the bottom of it, then hang it up to dry in the Sun; this ſaith a Painter (that told it me for a ſpeciall experiment) will make tranſparent and excellent blood-red colour, which you may alſo diſſolve in your Allum water, according as you have need thereof.

*Colours for Garments,*

*A Purple Colour.*

Take Logwood and ſeeth it in Vinegar and ſmall Beer in an earthen pot and put a little Allum therein untill you taſte it to be ſtrong on the tongue.

*A red Colour.*

Boil Braſil as you did the Logwood, and it will make a red colour: if you would have it a ſad red,

L 2

mingle

mingle it with pot-ash-water, if you would have it of a light red, temper it with white Lead.

*A Crimson.*

Sinaper tops, Sinaper lake, or Vermilion.

*A green-colour.*

Take Privet berry water, and change it with yellow berry water, and it giveth a perfect green, for the ground, and it is much used.

*Another green.*

Take Spanish green clean pickt and steeped in Rhenish wine, strain it and put it into a little Honey or white Sugar-candy, and it will make an excellent green.

*For a light green.*

Temper Verdigrease and white Lead, 2. Verdigrease, as much yellow berries, and a little white.

*Yellow-colour.*

Orpiment and Saffron; Masticot, Gambougiu; either of these give a very good yellow.

*Blew Colours.*

Verditer, Azure or Bice, blew Inde.

*Colours for building.*

Lay black and white Lead for the walls of Churches, Conduits, and greater buildings; Bolus for the pillars, and lesser houses; red Lead for Tiles; for the Leads blew and white; for Cottages soot alone.

*Colours*

*Colours for Landskip.*

Lay Verditer, blew, white, and green; or first go all over it with Saffron, and white: then put a little Soot to them and go over it again.

Or first take green and white Lead, and go over it, shadow it with a little more green, then with white, and last of all with green, a little white, and yellow berries.

*Sky-colour.*

Brasil and white Lead is the lightest, then light purple and white, then Inde blew and white, the darkest of all is Inde blew.

*Cloud-colours.*

The lightest of all is white Lead and Inde blew, a like quantity of each: the next, a great deal of Inde and a little white; then purple and white with a little Brasil; then white Lead, and yellow berries.

*Colours for the Sun-beams.*

Lay yellow berries with a little white, shadow it with Saffron and red Lead.

*A Moile-green.*

This colour is compounded of a red and green.

*A Lincoln-green.*

This colour is compounded of a good green and Saffron.

*A Popinjay green.*

This colour is compounded of Azure and Masti-  
cor, or blew and yellow.

*An excellent green.*

Take Copper plates, put them into a pot, and put

Some distilled Vinegar unto them, set them in a warm place untill the Vinegar become blew, then pour that liquor or coloured Vinegar into another Pot well leaded, and pour more Vinegar upon the Copper-plates again, letting that also stand untill it be of a blew colour; then pour it unto the former liquor, this you may do so often untill you have liquor enough, then let that liquor stand in the Sun untill it be thick enough.

*A Linnæus colour.*

This colour is made of red lead and masticot.

*A Peach colour.*

This colour is compounded of Cerufs and Vermilion.

*A Brass colour.*

This is made of Masticot and Umber.

*A marble or Asse colour.*

This colour is made with black and white.

*A Russet colour.*

This colour is made with a little white, and a good quantity of red.

*A brown blew.*

It is made of two parts of Inde baidias, and a third of Cerufs.

*A Crane-colour.*

It is onely made of red Lead ground with Gum-water.

*To write Gold with the pen or pensil.*

Take a shell of Gold and put a little Gum-water into it, and stir it about, and then you may work with it as with colours.

Thus by a little practising and tempering your colours one with another, you may with the same colours compound divers others that I have not mentioned, nay, almost what you list.

Ex-



## *Experiments perform'd by Legerdemain.*

### *How to make ice freeze by the fire side.*

**T**His feat cannot be performed at every time, but only in winter, and at such times as snow may be had, and he that will shew it, must have in readines an handfull of salt. The time serving, and the party provided, let him call for a joynt-stool, a quart-pot, and a handfull of snow, a little water, and a short staff or stick; first, let him pour a little water upon the stool, and upon it let him set the quart pot, and put the snow into the pot, the salt also but privately, then let him hold the pot fast with his left hand, and take the short stick in his right, and therewith churn the snow and salt in the pot, as if one should churn for butter, and in half a quarter of an hour the pot will freeze so hard to the stool, that you can scarcely with both hands pull it off from the stool: there is a natural reason may be given for this, which he that is a Scholar need not to be told, and for a common Jug.



ler I would not have so wife as to know, therefore I omit it.

*How to make two Bells come into one hand, having put into each hand one.*

**T**His feat must be performed with three Bells, you must put one Bell into your left sleeve, then put one Bell into one hand, another bell into the other hand ( they must be little Morris Bells ) withdraw your hands, and privily convey the bell in your left hand into your right hand: Then stretch both your hands abroad, and bid two folks hold your hands fast, but first shake your hands, and say, do you hear them. The Bell that is in your sleeve will not be known by the rattling, but that it is in your hand: Then say, he now that is the arrantest Whoremaster or Cuckold of you both shall have both the bells, and the other shall have none at all: op n your hands then and shew them, and it will be thought that you deal by Art Magick.

*How to make a Jugling Book, or Book of Wagery.*

**Y**OU must provide a Paper-book in Octave, of what thickness you please; first turn over seven leaves of it, and then upon both the open sides, draw or paint the pictures of flowers, then turn over seven leaves more and paint the very same; do this untill you have turned the book once quite over; Then unto the farther painted leaves, paste a little stay of paper or parchment one directly over another. Then turn over the book again, and having

ving turn'd every sixth leaf, draw the picture of flower-de-luces, and then paste staves of parchment upon them as you did upon the first; but these staves must all of them be a little lower than the former. Then turn over the the book again, and after the fifth leaf throughout the book is turned, paint horns: do thus untill you have painted the book full of pictures; onely let there be one part of the leaves fair paper; having thus finished the book, when you use it hold it in your left hand, and with your right hand, your thumb set upon the parchment staves, shew them orderly and nimbly, but with a bold and audacious countenance, for that must be the grace of all your tricks: say, This book is not printed thus as some of you may suppose, but it is of such a property that whosoever bloweth on it, it will give the representation of whatsoever he is naturally addicted unto, and then turn the book, and say, see it's all fair paper.

*Boxes to change Grain.*

**M**ake one Box of Wood, Tinne, or Brasse: let the bottom fall a quarter of an inch into the box, and glew thereon a laying of barley, or such like grain: draw the box with the bottom downwards, and say, Gentlemen, I met a Countrey-man going to buy barley, and I told him I would sell him a penyworth, also I would multiply one grain into so many bushels as he should need, then cast a barley-corn into your box, and cover it with a hat, and in the covering it, turn the bottom upside down: then cause some body to blow on the hat, then

then uncover it, and they will think strangely of it. You may make another box of wood like unto a bell, to hold so much just as your former box will; and make a bottom unto this box of shoole-sole leather, to thrust into the bottom of the bell: then fill it with barley, and thrust up the leather bottom, for it will keep the barley from falling out, take this box out of your pocket, and set it down gently upon the table, and say. I will not cause all the barley to go out of my measure into my bell, then with a hat cover the box that hath the barley glewed unto it, and in covering it, turn it with the barley downward; then say, first, let us see whether there be nothing under the bell, and clap it hard down upon the table, so the weight of the barley will thrust the bottom down; then bid some one blow hard on the hat, then take it up, where they will see nothing but an empty measure, then take up the bell, and all the barley will pour out. Sweep it then presently into your hat or lap, lest their busie prying may chance to discover your leather bottom.

*A Conceit to procure laughter.*

**T**AKE a ball in one hand, and another in the other, and stretch your hands as far as you can one from the other, and if any will, lay a quart of wine with him that you will not withdraw your hands, and yet will make both of them come into either hand which they please: It is no more to do, than to lay one down upon the table, and turn your self round, and take it up with the other hand, and your wager is won, and it will move no small laughter to see a fool so lose his money.

*How*

*How to knit an hard knot upon an handkercher, and  
to seem to undo the same with words.*

**M**AKE one plain loose knot, with the two corner ends, of a handkercher, with seeming to draw the same very hard, hold fast the body of the said handkercher (near to the knot) with your right hand pulling the contrary end with the left hand, which is the corner of that which you hold. Then close up handsomely the knot, which will be yet somewhat loose, and pull the handkercher so with your right hand, as the left hand end may be near to the knot; then will it seem to be a true and firm knot: and to make it appear more assuredly to be so indeed, let a stranger pull at the end which you hold in your left hand, while you hold fast the other in your right hand; and then holding the knot with your fore-finger and thumb, and the nether part of your handkercher with your other fingers, as you hold a bridle, when you would with one hand slip up the knot, and lengthen your reins. This done, turn your handkercher over the knot with the left hand, in doing whereof, you must suddenly slip out the end or corner, putting up the knot of your handkercher with your fore-finger and thumb, as you would put up the aforesaid knot over your bridle. Then deliver the same (covered and wrapt within the midst of your handkercher) to one to hold fast, and after the pronounciation of some words of art and wagers laid, take the handkercher and shake it and it will be loose.



*How to transform any one small thing into another form by folding of paper.*

**T**ake a sheet of paper and fold or double the same, so as one side be a little longer than the other: then put a Counter between the two leaves of the paper up to the middle of the top of the fold, holding the same so as it be not perceived, and lay a Groat on the outside there right against the Counter, and fold it down to the end of the longer side: and when you unfold it again, the Groat will be where the Counter was and the Counter where the Groat was, so as some will suppose that you have changed the money into a Counter, and with this many feats may be done.

*How to convey Money out of one of your hands into the other by Legerdemain.*

**F**irst you must hold open your right hand, and lay therein a tester, or some big piece of money, then lay thereupon the top of your long left finger, and use some words of Art, and upon the sudden, slip your right hand from your finger, wherewith you held down the tester, and bending your hand a very little, you shall retain the tester still therein, and suddenly drawing your right hand thorow your left, you shall seem to have left the tester there, especially when you shut in due time your left hand. Which that it may more plainly appear to be truly done, you may take a knife, and seem to knock against it, so as it shall make a great sound: but instead



stead of knocking the piece in the left hand ( where none is ) you shall hold the point of the knife fast with the left hand, and knock against the tester held in the other hand, and it will be thought to hit against the money in your left hand. Then after some words of Art pronounced, open your hand, and, when nothing is seen, it will be wondered at, how the tester came removed.

*How to make a Six-pence seem to fall through a Table.*

**Y**ou must have an handkercher about you, having a Counter neatly sewed in one of the corners of it: take it out of your pocket, and desire some body to lend you a tester, and seem to wrap it up in the midst of the handkercher, but retain it in your hand, and instead of so doing, wrap the corner in the midst that hath the Counter sewed in it and, then bid them feel if it be not there, which they will imagine to be no other than the tester that they lent you, then bid them lay it under a hat upon the table, and call for a basin of water, hold it under the table and knock, saying *vade*, come quick, and then let the six-pence fall out of your hand into the water. Then take up the hat, and take the handkercher and shake it saying, that is gone, then shew them the money in the basin of water.

*How to seem to blow a six-pence out of another mans hand.*

**T**Ake a six-pence, blow on it, and clap it presently into one of your spectators hands, bidding them

them to hold it fast : Then ask of him if he be sure to have it, then to be certain, He will open his hand and look. Then say to him, Nay but if you let my breath go off, I cannot do it. Then take it out of his hand again, and blow on it, and staring him in the face, clap a piece of horn in his hand, and retain the fix pence, shutting his hand your self. Bid him hold his hand down, and slip the tetter between one of his cuffs. Then take the stone that you shew scats with, and hold it unto his hand, saying, *By vertue here of, I will and command the Money to vanish you hold in your hand, Vade*, now see: when they have looked, then they will think that it is changed by the vertue of your stone. Then take the horn again and seem to cast it from you retaining it, and say, *Vade*, and anon say you have your money again : He then will begin to marvel, and say, I have not : say then to him again, you have, and I am sure you have it : Is't not in your hand? If it be not there : turn down one of your sleeves, for it is in one I am sure, where he findeth it, he will not a little wonder.

*How to cast a piece of Money away, and to find it in another mans mouth, pocket, or purse.*

**T**He Jugler calls for some one piece of Coin, as a tetter or a shilling of any one in the company, he willeth him to mark it with what mark he will, then he taketh it, and casteth it away, and cometh to his confederate ( who is furnished beforehand with the like piece of Coin, marked with the very same mark ) and bids him deliver the mo-

ney out of his pocket, purse, or if he say the word mouth; for this is concluded of before-hand. Now this confederate, to make the matter seem more strange, will fume and fret, asking how he should come by it, till having found the mark, he will confess it to be none of his, wondring at his skill, how he should send it thither: and all the rest be taken with a real admiration of his extraordinary cunning.

*How by the sound of a Counter phillipped to tell what side is uppermost, whether crosse or pile.*

**T**He Jugler draws a Counter out of his pocket, and saith to the company, See here is a Counter, take it who please, and let him phillip it up, and I will by my cunning tell you whether crosse or pile be uppermost by the very sound, for you shall hoodwink me. Now there are three, or four, or more confederates in the place, who seeming strangers as well as the rest, will be very importunate to have the philliping it, and before one of these shall have it, who by some sign of the fingers or countenance (foreknown to the juggler) do give him information after he is demanded. Of the same nature is that trick formerly mentioned in the book, and called, The decollation of *John Baptist*.

To make one dance naked is a trick of the same nature, for the party afore-hand is agreed to do it, and also the manner and circumstances: So that the Jugler to blind the people, pronounceth sundry words to such a person, he then begins to rave like a mad man, and puts his cloaths off with a kind of violent

violent carelesness, though God knows, the party knows as well what he doth, as your self that reads it.

After the same manner shall you know what money another hath in his purse, and casting money into a pond, and finding it under a stone or threshold in another place.

Also to make a piece of money to leap out of a cup and run to another, by means of a small hair fastened to the money, which hair the Confederate guideth, with a multitude of such like strange feats, which may seem impossible to the judgement of the common people to be effected without the assistance of the Devil, or some familiar, which to nominate is neither needfull, nor will my occasions permit so much leisure as to do it.



## Experiments in Arithmetick.

### I.

*To finde what number of Men are contained in a square Battail.*

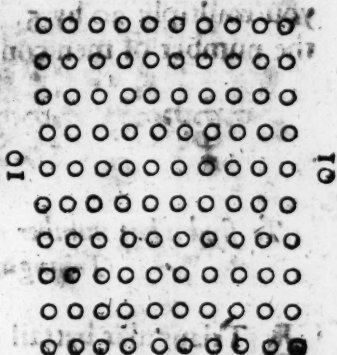
**A** Square in Geometry is called, A right lined plain figure, consisting of four equal sides, and so many right and equal angles, every

every of which sides is said to be the Square of the said figure, and any one of these sides being multiplied in it self produceth a Square equal to the Square of whose side this multiplication was made.

Wherefore if you should come in place where a body of men were placed in a Square body, you may readily tell what number there is of them, by counting the number of men on any one side, and that number multiply in it self, the product of that multiplication shall be equal to the number of men in that whole body.

As for example.

If there were ten men on each side of the Square Battail (as in this figure there is) If then you multiply 10 into it self, the product will be 100, which is the number of men contained in the said Battail.



II.

To find what number of men are contained in a Battail, whose front and flanks are equal.

**T**His proportion very little differeth from the former; for whereas before you multiplied any

M

one



one side in it self, you must in this multiply the Front or Rear by either Flank, and the product shall give the number of men contained in the said Battail.

### Example,

	Rear		Suppose there
	○○○○○○○○○○○○○○○○○○○○		be 20 in the Front
Flank	○○○○○○○○○○○○○○○○○○○○	Flank	and five in the
	○○○○○○○○○○○○○○○○○○○○		Flank, and you de-
	○○○○○○○○○○○○○○○○○○○○		fire to know what
	○○○○○○○○○○○○○○○○○○○○		number there is in
	Front		the whole body: If

you multiply 20 by 5, your product will be 100, the number of men contained in the whole Body.

### III.

*To find what number of men are contained in a Triangular Battail.*

**A** Triangular battail cannot be composed except there be an odd man in the Front, and consequently, on either Flank : Wherefore, to find what number of men are contained in such a battail, you must multiply either Flank in it self, and the product shall be the number of men contained in the whole Battail.

Example,

Rear.

Let there be in either Flank 7, now we know that 7 is the Root of 49; wherefore you may conclude 49 to be in the whole.

Right-flank

Left-flank

.....  
.....  
.....  
.....  
.....  
.....  
.....

Fronts

IV.

Of two Square Battails to make one intire battail, which shall contain both the other.

A General having in two severall places two Square Battails of men, and commanding his Major or other Officers to reduce them into one entire body, I demand how that may be done? Let the two Battails be unequal, as one of 10, the other of 6; as in this Figure is seen.

12

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6

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6

M

Example.

## Example.

First, square the side of the greater Battail 10, *scilicet* 100. then square the side of the lesser Battail 6, *scilicet* 36. which added make 136. the square root extracted gives the side of a Battail equal to them both : but for as much as 136 is no square number, you must finde the nearest square that may be less, and that shall be the side of the entire Battail, which is 11. wherefore place 11. in rank, and 11. in file, and you shall have 121. in your Body, and 15. men over, which you may send out for Scouts or Centinels, or otherwise dispose of them as occasion serveth.

## V.

*A number of men being delivered to an Officer to make thereof a Square Battail, and suddenly to tell how many ranks he shall have, and how many men in each rank.*

**S**uppose the number of men delivered to be 144. therefore extract the square Root of 144, which is 12, and so many men shall you have in flank, and as many in file. Note that if the number had not been a square number, there would have been some odd men remaining, which you should have disposed of as before.

oooooooooooo  
 oooooooooooooo

## VI.

The wall of a Fort or Castle being thirty foot high, and the breadth of the Trench about the wall forty foot broad, I demand the length of a scaling-Ladder that will reach from the edge of the Trench to the top of the wall.

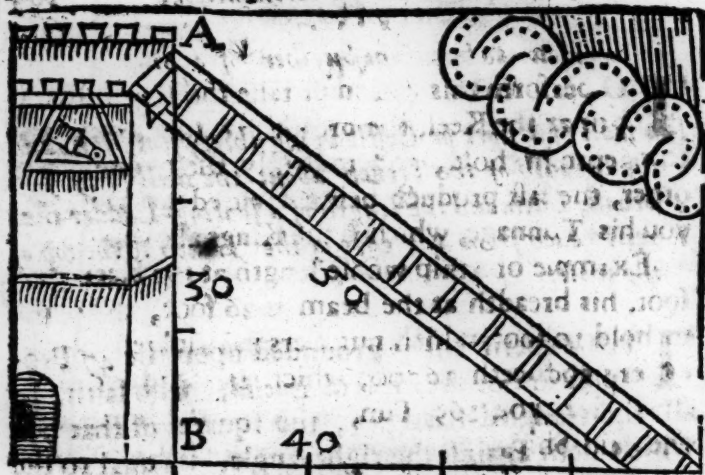
**T**His experiment is grounded upon the 47 Proposition of the first of Euclid, who saith, In all right-angled-triangles, the square of that side which lieth against the right angle, is equal to the two squares of both the other sides.

From whence we may gather, that if the height of the Wall be squared, and the breadth of the Trench likewise squared, and those two squared numbers added together, and from them extract the square Root, that Root so extracted shall be the length of the Scaling-ladder required.

As for Example, in the Figure following.

M 3

Let



Let A B represent the Fort, being 30 foot high, and B C the breadth of the Trench, 40 foot, then square 30, *scit* 900, likewise square 40, *scit* 1600: which added make 2500 the Root of which number is 50, the length of the Hypothenuall or Scaling ladder required,

## VII.

Admit the Semidiameter of the earth to be 3346 miles, and that there is a Mountain one mile in height. I demand how far such a Mountain may be seen at sea or on Land.

**A**dd the Semidiameter of the earth and the Mountain together, *scit* 3437, whose square is 11812969. From which substract the square of the semidiameter of the earth, *viz.* 11806096, there remains 6873, whose Root is 82 and three fourths; wherefore you may conclude, that the Mountain may be seen almost 83 miles.

VIII. How



## VIII.

*How to know the burthen of a Ship.*

**T**O perform this you must take the length thereof at the Keel, the breadth at the Beam, and the depth in hold, and multiply them one in the other, the last product being divided by 100 gives you his Tunnage, which is the Kings allowance.

Example of a ship whose length at the Keel is 65 foot, his breadth at the beam is 26 foot, the depth in hold 10 foot, which numbers multiplied each by other produceth 16900, which being divided by 100, gives you 169 Tun, which is the burthen of the said Ship.

## IX.

The General delivered to his Master Gunner 3 Pieces of Ordnance, together with 168 pound of powder, the biggest of which Pieces spent at a shot 6 pound, the second 4 pound, and the third 2 pound, who commanded him to employ them against the battery of a Sconce, demanding of the Gunner how many shots each piece would make, being discharged one as often as another, and also how much powder each Piece would spend.

**L**et the quantity of each Piece lib.  
be set down into order, one 6 lib.  
under another, and added into 4 168 lb.  
one entire sum, as 6. 4. 2. 2 222 14  
fecit 12, behind which towards 12 x  
the right hand set down the  
summe of the Powder delivered, viz. 168. which if  
you divide by 12, the quotient will be 14, which  
certainly telleth that they will make 14 shots a piece  
against the Sconce.

M 4

Now

Now to know how much powder each Piece will spend, multiply 14 by 6, *fecit* 84, for so much will the first Piece spend; again multiply 14 by 4, *fecit* 56, so much will the second spend; and lastly multiply 14 by 2, *fecit* 28, so much will the last Piece spend: 28, which being added into one entire summe, 168 the total will be 168 pound, which is equal to the powder by the General at first delivered.

## IX.

A General having drawn the platf. *rm* a of Fort, demanded of 50 Pioneers what time they required to finish it in: who replied 36 weeks, or 36 dayes (which is all one) but the expedition was such that it must be finished in 8 dayes now would I know what number there must be employed.

THE resolution of this question to some may seem difficult, but to others very plain and easie, for if you multiply 50 (which is the number of Pioneers) by 36 (the number of dayes which they require) and divide that product by 8 (which is the time that the Fort must be finished in) the quotient of that division will be 225, and so many must be employed to finish it in eight dayes.

Pleasant



# Pleasant QUESTIONS IN ARITHMETICK.

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## Question I.

*To tell the number that another man shall think, be it never so great.*

**L**ET the party that thinketh, double the number which he thought; which done, bid him multiply the sum of them both by 5, and give you the product ( which they will never refuse to do, it being so far above the number thought ) from the which if you abate the last figure of the product ( which will always be a Cipher or 5 ) the number thought will remain.

### Example.

Let the number thought be 53, which doubled maketh 106, and multiplied by 5, makes 530, then if you take away the Cipher which is in the last place, there will remain 53, the number thought.

Quest.

## Quest. II.

*Of the accusation of a Thief.*

**A** Thief breaking into an Orchard, stole from thence a certain number of Pears, and at his coming forth he met with 3 men one after another who threatned to accuse him of theft, and for to appease them, he gave unto the first man half the Pears that he stole, who returned him back 12 of them. Then he gave unto the second half of them he had remaining, who returned him back 7. And unto the third man he gave half the residue, who returned him back 4, and in the end he had still remaining 20 Pears. Now do I demand how many Pears he stole in all? To answer this question you must work backward; for if you take 4 from 20, there will remain 16, which being doubled make 32, from which abate 7, and there will remain 25, which being doubled makes 50, from which subtract 12, and there will remain 38, which again doubled make 76, the true number of Pears that he gathered.

## Quest. III.

*Of Three Sisters.*

**A** Certain man having three Daughters, to the Eldest he gave 22 Apples: to the second he gave 16 Apples: and to the third he gave 10 Apples: and sent them to the Market to sell them, and gave them command to sell one as many for a penny as the other (namely 7 a penny) and every one to bring him home so much money as the other, and neither change

change either apples or moneys one with another ;  
How could that be ?

This to some may seem impossible. : but to the  
Arithmeticians very easie. For whereas the eldest  
had 3 peniworths and one apple over, the second  
two peniworths and two apples over, and the  
youngest had one peniworth and three apples over :  
So that the youngest had so many single apples, and  
one peniworth, as the eldest had peniworths and  
one apple over, and consequently the second propor-  
tional to them both.

They made their Markers thus: A Steward com-  
ing to buy fruit for his Lady, bought all the ap-  
ples they had at 7 a penny, leaving the odde ones  
behind, then had the eldest Sister three pence and  
one apple, the middle Sister two pence and two  
apples, and the youngest one penny and three apples.  
The Steward bringing the fruit to his Lady, she liked  
it so well, that she sent him for the rest ; who re-  
plied that there were but few remaining : she not-  
withstanding sent him for them, and bid him bring  
them at any rate. The Steward coming to the Mar-  
ket again, could not buy the odde apples under a  
penny apiece ( who to content his Lady was fain  
to give it ) then had the youngest Sister three pe-  
niworths, the middle Sister two peniworths, and  
the eldest one peniworth, and so had they all four  
pence a piece, and yet sold as many for a penny one  
as another, and neither changed apples nor moneys  
one with another, as they were commanded.

Quest.



## Quest. IV.

*Of one that bought and sold both at a rate, and yet in the end proved a Loser.*

**A** Man bought 100 Egges at three a penny, having 120 to the hundred, also he bought a hundred more at two a penny, having likewise 120 to his hundred, these Egges being mingled, he sold them away for 5 two-pence, and 120 to the hundred as he bought them, the question is whether he gained or lost in that bargain.

If you work by the Rule of Three Direct, you shall find that his 120 Egges at 3 for a penny came to three shillings four-pence, and his 120 at 2 for a penny came to 5 shillings, which being added make 8 shillings 4 pence. Then again to see what they come to at 5 for 2 pence; work likewise by the rule of Three Direct, and you shall finde that 240 at 5 for 2 pence, comes but to 8 shillings, whereby the seller loseth 4 pence of the money they cost him.

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Experi-



## Experiments in Geometry.

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### I.

*How to take the Altitude of a Building, or other approachable height, by a line and plummet, the Sun shining.*

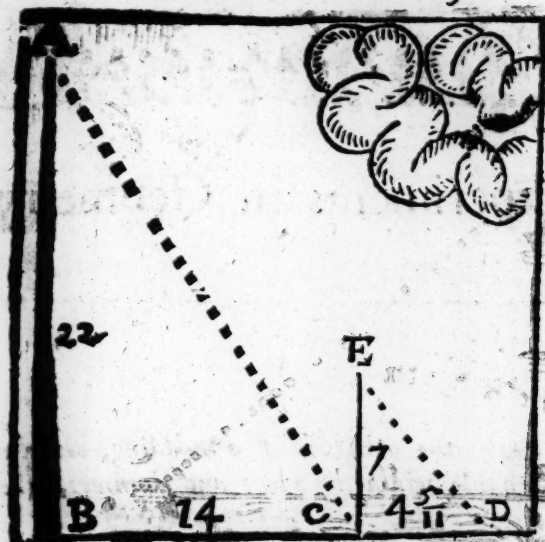
**L**et the Building whose Altitude you desire to know be A B representing a May-pole casting his shadow in a right line on the ground to C, at C let fall a line and plummet (whose length before you know in feet or inches) observing where the end of that shadow lights, which suppose at D, then measure the length of the shadow of the string, and consequently the shadow of the building, both which being exactly taken, work thus by the Rule of Proportion?

If C D, the shadow of the line and plummet 4 foot, and  $\frac{1}{2}$  give E C, 7 foot in altitude;

What altitude doth 14 feet give, which is the length of the shadow of the May-pole.

Multiply and divide according to that Rule, and you shall finde in your quotient 22 foot, which is the true altitude of the building required.

*How*

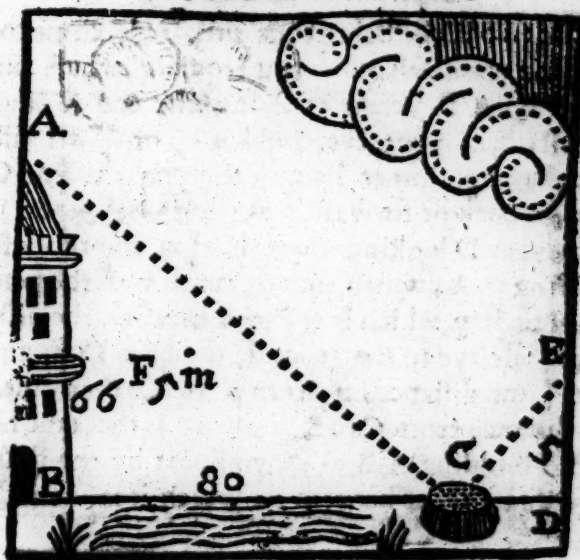


*How to take the Altitude by a Bolle of water.*

**P**Lace on the ground a Bolle of water, which done, erect your body straight up, and go back (in a right line) from the building, till you espy in the Center or middle of the water the top of the Altitude; which done, observe the place of your standing, and measure the height of your eye from the ground, together with the distance from your standing to the water, and the distance of the water to the Base or foot of the Altitude; which being all exactly taken, will help you to the Altitude required, by the rule of proportion.

*Example.*

Let the Altitude required be AB, the Bolle of water placed on the ground at C, then go backwards from C your body erected as straight as may be tie  
your



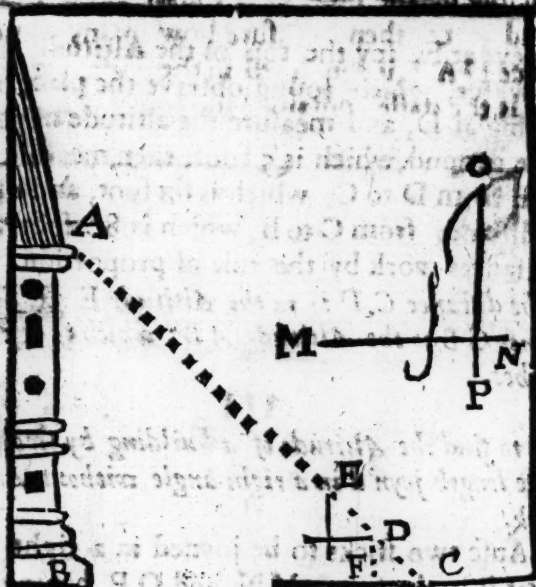
your eye at E, spy the top of the Altitude A B in the water, which found observe the place of your standing at D, and measure the altitude of your eye to the ground, which is 5 foot, then measure the distance from D to C, which is six foot, and likewise the distance from C to B, which is 80 foot, these 3 distances work by the rule of proportion. Thus, *As the distance C D is to the Altitude E D, So is the distance C B to the Altitude A B; which is 6 foot and 8 inches.*

## III.

*How to find the Altitude of a building by two sticks of one length joyn'd in a right angle, without Arithmetick.*

**C**Ause two sticks to be joyned in a right-ang<sup>e</sup>,  
as is in the figure MN, and O P, having at O a  
hole made wherein to hang a thread and plummet.  
The

The two sticks being thus prepared, come to the building whose altitude you require ( which building let be  $AB$ , ) then applying the end  $A$  of your cross staffe to your eye, hold it up or down till the thread and plummet hang just upon the line  $CD$ , then go back or forward ( as occasion is given ) till your eye at  $D$  looking over  $E$  espy the top of the building at  $A$ ; which found, mark well the place of your standing, which is at  $F$ , and measure the distance from your eye to the ground, which is  $DE$ , and set that same distance off, from  $F$  to  $C$ , then measure the distance from  $C$  to  $B$ , for that is the true height of the building  $AB$ , as may appear by the figure, & likewise by the Theorem on which it is grounded.



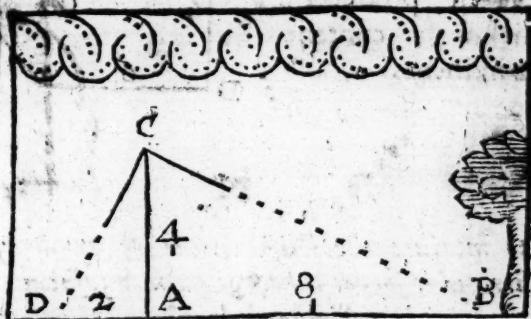


IV.

*How to finde a distance by the two Sticks joyned square.*

**T**His Experiment is grounded upon the 4 Prop. of the 6 Euclid.

Let the distance which you desire to know, be A B. set up a staffe at A. of 4 foot long, ( or more or less at your pleasure, ) at A C. at the end of the staffe C. place a thread C D. then hanging the angle of the square O. on the top of the staffe at C. lift it up or down, till you see the farthest part of your Longitude, the square so remaining, and the staffe not removed, draw the string that is fastened at C. close by the side of the square, till it touch the ground at D. then measure how many times the distance D A. is contained in the staffe, for so many times is the staffe contained in the Longitude.



*Example:* The staffe supposed 4 foot high placed at A. and the square being hung thereon at C. the one end thereof pointing at B. and the other to D. then

then measure the distance  $DA$ , and you finde it to be two foot, then say, if  $CA$  contain  $DA$  two times  $AB$  shall contain  $CA$  as many, that is 8 foot, as may appear by the figure.

## V.

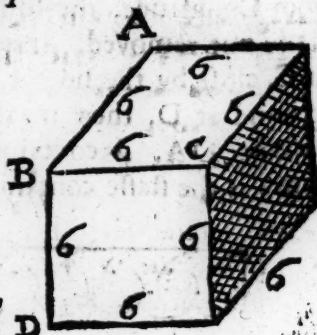
*How to measure the solidity of a Cube.*

**T**HE Cube is a body composed of 6 square superficies of equal proportion, and is measured in manner following.

If you multiply any one side in it self cubically, it produceth the said Cube.

*Example.*

Let the Cube  $ABCD$  be given to be measured, the sides whereof are six inches in length, the square whereof is 36, which again multiplied by the root produceth 216, which is the content of a Cube in inches, whose sides are six inches in length.



## VI.

*How to measure the solid content of any body how irregular soever it be, the form or fashion not regarded.*

**T**O perform this you must prepare an hollow Cube, into which put your irregular body, which

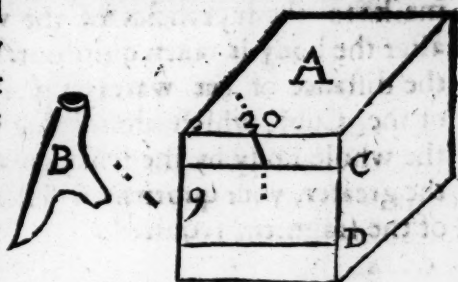
which being placed therein you shall pour in so much water till it no more than cover the body in the Cube, then make a mark in the inside of the Cube where the superficies of the water toucheth. This done, take out the irregular body, and mark again directly under the former, where the brim of the water now toucheth, for the distance of these 2 marks, multiplied by the square of the Cubes side, produceth the crassitude of that irregular body.

*Example.*

Suppose A. to be the cubical hollow vessel, whose inward side suppose to be twenty inches: B. the irregular body whose crassitude I desire. First, therefore I put B. into the hollow Cube A. and pouring in water till

it be thoroughly covered, admit the brim of the water reach unto C, then taking out that irregular body again, admit the superficies of the water fall to D. then measure the distance between C. and D. which suppose is 9 inches,

which multiplied in 400, the square of the Cubes side produceth 3600. and so many cubical inches are contained in the irregular body B.



## VII.

*How the Weight of any part or portion of a solid body may be known, without separation thereof from the other part of the body.*

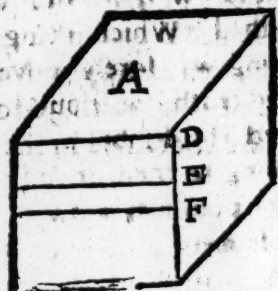
**H**AVING a Cube prepared as before declared, first, put the solid body therein, which done fill the Cube top full of water, then softly lift that body out of the water, till such time as there remain no more in the water than that portion whose weight you desire to know, at that instant make a mark on one side of the Vessel where the superficies of the water then toucheth, then take out the body all together, this done, measure the distance from the former mark to the superficies of the water as it is now after the body is taken quite out. Likewise measure the distance of the waters superficies from the top of the Cube, which done, augment the weight of the whole body by the lesser distance, and divide by the greater, your quotient will shew the true weight of the fragment required.

## Example.

**Admir B C.**

to be in all 100 pound weight being either brass, iron, silver, lead, stone, or other metal, my desire is to know the

weight of the portion C. first therefore putting the whole



whole body into the vessel A. I fill it full of water, then lifting it softly up till all the body be out of the water excepting C. I finde the superficies of the water to be fallen to E. where I make a mark, then take out the whole body, admit the water is fallen to F. and that by measuring I finde E F. to be 8 inches, and D F. 20 inches, 8 multiply ed in 100, & the whole pillars weight yieldeth 800 which divided by 20 (the greater distance) bringeth in the quotient 40, so many pound weight I conclude the portion C. to weigh.

## VIII.

How Archimedes found what quantity of Gold was taken out of the King of the Syracusans Crown, and how much silver put in the room thereof, without breaking of the Crown.

**H**iero, King of the Syracusans in Sicilia had caused to be made a Crown of gold of a wonderful weight, to be offered for his good success in the wars, in making whereof, the Goldsmith fraudulently took out a certain portion of gold, and put in silver for it, so that there was nothing abated of the full weight, although much of the value diminished: Which thing at length being uttered, the King was sorely moved, and being desirous to try the truth, without breaking of the Crown, proposed the doubt to Archimedes, unto whose wit nothing seemed impossible, which although he could not presently answer, yet he had good hopes to devise some policy for that invention, and so musing thereon, as he chanced to enter into a bane of water



water to wash him, he observed that as his body entred into the bane, the water did run over, whereby his ready wit of such small effects conjecturing greater works, conceived by and by a reason of solution of the Kings question, and therefore rejoycing exceedingly (more than if he had gotten the Crown it self) forgot that he was naked, and so ran home crying as he ran *inveni, inveni*, I have found, I have found, and thereupon caused two massie pieces, one of gold and another of silver, to be prepared of the same weight that the Crown was of, and considering that gold is heavier of nature than silver, and therefore gold of like weight with silver, must needs occupy less room by reason of its more compact and sound substance, he was assured that putting the mass of gold into a vessel brim full of water, there would not so much water run out, as when he should put in the silver mass of like weight. Wherefore he tryed both, and noted not only the quantities of the water of each time, but also the difference or excess of the one above the other, whereby he learnt what proportion in quantity is between gold and silver of equal weight, and then putting the Crown it self into the water brim full (as before) marked how much water did run out then, and comparing it with the water that run out when the gold was put in, noted how much it did exceed that, and likewise comparing it with the water that run out when the silver was put in marked how much it was less than that, and by those proportions found the just quantity of gold that was taken out of the Crown, and how much silver was put in instead of it; by the which  
ever

ever since the proportions of metals one to another are tryed and found.

## IX.

*How a man may descend into the bottom of any Water or River, his body remaining dry.*

**T**HIS Experiment was shewed at Toledo, by two Greeks, who taking a Cauldron of great capacity the mouth turned downward, and so hanging it in the air by ropes, they fasten certain shelves in the midst of the Cauldron, where they place themselves and a fire. Then to make it hang at *aqua libra*, they compass the Circumference thereof with leaden plummetts on every side equally, and made of equal weight, lest any part of the Circumference of the mouth of the Cauldron when it is equally and softly let down into the water, should sooner touch the water than the whole Circumference, so should the water easily overcome the air inclosed in the Cauldron, and resolve it into moisture. But if by due proportion (the Cauldron thus prepared) be softly set down into the water, the air inclosed in the Cauldron (by resistance of the water) shall violently make himself place, not admitting the water to enter. So the men there inclosed, shall so long remain dry in the midst of the water, untill success of time do by respiration weaken and consume the inclosed air. But if in due time the Cauldron be softly and equally drawn out of the water, the men shall remain dry, and the fire not extinct.

*This Experiment may thus be proved.*

Take a Cup or Glas of a certain quantity, the Circumference of the mouth whereof shall be broader than the Circumference of the bottom, in the mouth whereof let be fastned a little stick, tying thereto a thread and plummet. On the stick fasten a little Candle of Wax, whose light may come only to the middest of the Cup, lest too much nearness of the water might suffocate the Candle; Then proportionably (as in the former Experiment) put the cup with the burning Candle into a Vessel full of water, and in due time draw it out softly and equally, so that no part of the mouth or Circumference thereof be drawn out before the whole, so shall the Candle remain burning as it was when it went in.

*What proportion ought to be used in building of all Ships whatsoever.*

**T**HE due proportion of a Ship is that the Longitude of the Vessel whatsoever it be, more or less, ought to be divided into 300 equal parts, of the which parts 30 must be assigned to the depth, and the breadth shall contain 50, or the sixth part of the longitude, so shall the Ship be both proportionable, and more safe for Traffique.

## XI.

*The Description of a Ship that cannot be drowned.*

**T**HIS Experiment was invented by one Leonardo Favivanti an Italian, who affirmeth that the like was never invented since the creation of the World. He describeth the said Ship on this manner, Take Beams of Firre or Pine- Tree, which of their own nature can never go down or sink, or abide under the water, and with these beams frame an Engine of the length of 60 foot, and 11 of the breadth of 20 foot, and of the height of 6 foot, laying the first rank in length, and the other traverse, and the third again in length, fashioning the forepart like unto other Ships, and in like manner being the hinder part to good form, then with Irons binde it and fasten it that it cannot break, and upon this frame or foundation build your Ship of such fashion as you think best, so shall it be able to carry any voyage, without fear of drowning,

## XII.

*How to order a Picture, that if you look on the one side shall represent one thing, and on the other side another thing, and just before in a confusion.*

**L**ET the two Pictures which you intend thus to order be both of one length and breadth, and provide a board of the same bigness about an inch thick,

thick, which must be planed in an indented form, (as are those boards which women use to pleat their Cuffes with, but the indentings must be a great deal bigger,) which provided, cause the Pictures to be cut exactly in long Labels of the same breadth as the sides of the indentings are; this done with paste or fine starch, paste those Labels to the sides of the indentings, one on the right hand and the other on the left hand, so proceeding till you have done all the Labels of the Pictures, then hanging it up, if you stand on the right side of the Picture, you shall see that Picture which was pasted on the right side of the indentings, and if on the left side of the Picture, the other, and right before in a confusion, which conceit hath caused no small admiration to those that know not the reason thereof.

## XIII.

*To break a Staffe upon two Glasses of water.*

**P**Lace the Glasses being full of water upon two joynt Stools, or such like, equidistant from the ground, and distant one from another, the length of the Staffe; Then place the ends of the Staffe upon the edges of the two Glasses, so that they be sharp, this done, with all the force you can, with another Staffe strike the Staffe which lies on the Glasses in the midst, and it will break, without breaking the Glasses or spilling the water.

## XIV. To



## X IV.

*To make a Glas of water seem to boil.*

**T**AKE a Glas near full of water, and setting one hand upon the foot of it, hold it fast, turn slightly one of you fingers of your other hand upon the brim or edge of the Glas, having before privately wet your finger, and so passing softly on with your finger in pressing a little, the water will seem to boil and leap over the Glas by drops.

## X V.

*How to know the hour of the Day by the hand and fingers.*

**T**AKE a straw or the like, of the length of the Index, or the second finger, hold this straw very right between the thumb and the right finger, then stretch forth the hand, and turn your back and the palm of your hand towards the Sun, so that the shadow of the muscle which is under the thumb touch the line of Life, which is between the middle of the two other great lines, which is seen in the palm of the hand; this done, the end of the shadow will shew what of the clock it is, for at the end of the great finger it is 7 in the morning, or 5 in the evening, at the end of the ring-finger, it is 8 in the morning, or 4 in the evening, at the end of the little finger, or first joynt, it is 9 in the morning, or 3 in the afternoon, 10 and 2, at the second joynt, 11 and 1, at the third joynt, and mid-day in the line following, which comes from the  
end

end of the Index ; Note that this Experiment must be performed by the left hand.

## XVI.

*How to make two Images, one of which shall light a Candle, and the other blow it out.*

**U**Pon the side of a wall make the figure of two Images, in the mouth of each put a pipe or quill, so artificially that it be not perceived, in one of which place Salt-peter very fine, and dry and pulverised, and at the end set a little match of paper, in the other quill Sulphur, beaten small; Then holding a lighted Candle in your hand, say to one of those Images by way of command, blow out the Candle, then lighting the paper with the Candle, the Salt-peter will blow out the Candle immediately, and going to the other Image, (before the snuff of the Candle be out,) touch the Sulphur with it, and say Light the Candle, and it will immediately be lighted.

## XVII.

*How to disguise or disfigure an Image, as a head, an arm, a whole body, &c. so that it hath no proportion, the ears to be over long, the nose as that of a Swan &c. yet the eye placed at a certain point, will be seen in a direct and exact proportion.*

**I**Will not strive to set a Geometrical figure here, forsoear it may seem too difficult to understand, but I will endeavour by discourse how mechanically you may with a Candle perceive it sensible ; First, there must be made a figure upon paper, such

*Experiments in Geometry.*

such as you please, according to its just proportion, and point it as a Picture, afterwards put a Candle upon the Table, and interpose this figure obliquely between the said Candle, and the Books of Paper, where you desire to have the figure disguised, in such sort that the height pass a-thwart the hole of the Picture, then will it carry all the form of the Picture upon the Paper, but with deformity; follow these tracts and mark out the light with a coles black head or ink, and you have your desire.

To finde now the point where the eye must see it in its natural form, it is accustomed according to the order of Perspective to place this point in the line drawn in height equal to the largeness of the narrowest side of the deformed square, and it is by this way that it is performed.

*How to make a Clock with one wheel.*

**M**ake the body of an ordinary Dial, and divide the hour in the circle into 12 parts, make a great wheel in height above the Axel-tree, to the which you shall place the Cord of your counterpoise, so that it may descend, that in 12 hours of time your Index or Needle make one revolution, which may be known by a Watch, then put a balance, which may stop the course of the Wheel, and give it a regular motion, and you shall see an effect as just from this, as from a Clock with many Wheels.

## XIX.

*To find what is bidden in two hands.*

**S**uppose that a man holds divers things in his hands, as Gold and Silver, and in the one hand he holdeth the Gold, and in the other the Silver, now to know which hand the Gold is in, and which the Silver, appoint for the Gold 4 shillings, and for the Silver 3 shillings, or any other prices, so one be odd, and the other even, then bid him triple that which is in the right hand, and double that which is in the left hand, then bid him adde these two products together, and ask him if it be even, or odde; if it be even then the Gold is in the right hand, if odde, the Gold is in the left hand.

## XX.

*To make a Cone to move by the edge of a Table.*

**M**ake therefore a Cone of paper, and set it on the Table cunningly conveying under it a Beetle, or such like creeping thing, and you shall see the thing to move on the Table, as if the paper were a living creature.

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*Exact Rules for Ringing all sorts  
of Plain Changes, and Cross Peals,  
with Directions for Pricking; also how  
to Hang Bells, with easie Directions for  
every thing which necessarily belongs to  
the Compleat Art of Ringing.*

**T**O avoid all circumlocutions, he that intends to enter himself into a Company, must in the first place be able to set a Bell fore-stroak, and back-stroak; in the next place, he must know how to Ring round, or under Sally; neither must he be ignorant in the tuning of Bells; for the attaining of which, let him learn on Wire Bells, that he may know a Third, Fifth, and Eighth, which are the Principal Concords; or a Pitch Pipe made by an Organist may serve as well, containing eight Notes, or more, with their sharps, and flats, very useful in the Tuning of Bells.

Take this as a general Rule, begin at the Tenor or biggest Bell, and count three whole Notes, then an half Note or Sharp; three whole Notes, then



( 2 )

then an half Note or Sharp, and so on till you come to the least Bell, or Treble. For example, on four Bells, 1. 234, here the 432, are whole Notes, and the half note or sharp, is between the 1 and 2. On five Bells, 12:345, the 543, are whole notes, and the half note or sharp is between 2 and 3. On six Bells, 123:456. the half note or sharp is between 3, and 4. On eight Bells, 1:3345:678. one half note, or sharp, is between 5, and 6, and the other between 1, and 2. On ten Bells, 123:4567:8910. here one half note is between 7, and 8, and the next between 3, and 4. On twelve Bells, 12:345:6789:101112. here one half note, or sharp is between 9, and 10. the next between 5, and 6. and the other between 2, and 3. which last is made contrary to the former Rule, it being but two whole notes, from the next half note to it; the reason is this, the Ninth is one whole note below the Eighth, therefore the 2. must be a whole note below the Treble, otherwise they would not be a true Eighth; therefore the half note is put between 2, and 3. With these Rules are required good Ears, to judge of the Concords, and then he will easily know whether the Bells be in Tune or not.

*Of the Changes*

**A** Change between two Bells that strike next to each other, is no more than removing in to each others place, as 1, 2. the Change 2, 1. and so into their proper places again, 1, 2.

On three Bells there are six several Changes, in Ringing of which you must observe a Bell called the Hunt, the other two are called the extreme Bells, but improperly, because every Bell Hunts in the six Changes. The name of Hunt is properly given to it, because of its continual motion up and down amongst the other Bells: the other two Bells are called extremes: because when the Hunt is either before or behind them, there is a Change to be made then between them, called an extreme Change. There are two several waies to Ring the six Changes; the first by making the Treble Hunt, and the other the Tenor, supposing the Bells to stand thus, 123, you must Hunt the Treble thus; Hunt the Treble over the Second, and Third, making a Change between the Treble on each of those two Bells in order; therefore first you must remove the Treble up over the Second, into the Seconds place, by making a Change between the Second and Treble thus: 213. The Treble being removed up over the Second, it must next be removed up over the Third thus, 231.

Here note that when the Hunt moves from the foremost Bell towards the hindmost, then it Hunts up, as in the Changes afore specified; but when

it moves from the hindmost Bell, towards the Bell that leads, then it Hunts down as by the following Changes. The Treble being Hunted up behind the extream Bells, an extream Change is next to be made between them, 321. The extream Change being made, the Treble must be Hunted down again before the Bells in this manner, 312—132. The Treble being now Hunted down, the next is to be an extream Change, 123. the last Change of the Six.

The other way of Ringing the Six Changes, is by making the Tenor the Hunt, which being behind already, it must first be Hunted down, as in these Changes, 123—132—312. The Third, which is the Hunt, being Hunted down before the Bells, the extreme Change must next be made between the 2 and 1, which are the extream Bells thus—321. The extream Change being made, the Third must be Hunted up again 231. The Third being Hunted up, another extream Change must be made which brings the Bells round in their right places again—123.

Now on four Bells, there are four and twenty Changes, in Ringing of which, there is one Bell called the Hunt, and the other three extream Bells; it never lies but once in a place, except when it comes before or behind the Bells, at which time it lies there twice together, it has the same course as in the six Changes aforesaid, two of the extream Bells make a Change every time the Hunt comes before or behind them.

<p>These four Figures          234, representing          the four Bells, the          Treble must be          Hunted up behind          the Bells thus,</p>	<p>The next is to be          an Extrem Change          between the two          farthest extream          Bells, from the          Hunt, which are the          Second and Third.</p>
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<p>The Treble being          Hunted down, an          Extream Change          between the Second          and Fourth,</p>	<p>The Extream being          made Hunt, the Tre-          ble as before mak-          ing an Extream          Change, every time          Hunt comes before          or behind the Bells.</p>
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The twenty four Changes are to be Rung another way in Hunting up the Treble, which is by making every Extream Change between the two nearest Bells to the Hunt, as in these Changes; first, I Hunt the Treble up thus——— 1234

These two waies of Ringing the 2134  
Twenty four differ only in making the 2314  
Extream Changes; the one must be be- 2341  
tween the two farthest Extream Bells from the  
Hunt, and the other between the two nearest  
to it.

As you Hunt the Treble, so must you  
Second, Third, and Fourth. The way of  
Hunting the Third up, and making the 1234  
Extream Change between the two farthest 1243  
Bells from it, is thus, First I Hunt up the 2143  
Third over the Fourth; the Hunt being up, 2134  
I make an Extream between the Treble, and 2314  
the Second, and then Hunt down the Third 3214  
again, and so to the end of the Peal after  
this manner.

The twenty four plain Changes are to be Rung  
sixteen several waies, for in Hunting one Bell it is  
to be Rung four waies, that is, two in Hunting it  
up, and two in Hunting it down, so that four Bells  
make four times four, which is sixteen: some of  
which I have be es t down.



Treble Hunt up Extream between the two farthest Bells from it.	Second up, Extream be- tween the two nearest to it.	Fourth down Extream be- tween the two far- thest Bells from it.
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1234	4312	1234	4231	1234	3421
2134	4132	1324	2431	1243	3241
3142	1432	1342	2341	1423	3214
2341	1423	1342	3241	4123	2314
3241	4123	1432	3421	4132	2341
3214	4213	1423	3412	1432	2431
3142	4231	1243	3142	1342	4231
1324	2431	2143	3124	1324	4213
1342	2413	2413	3214	3124	2413
3412	2143	4213	2314	3142	2143
3421	1243	4123	2134	3412	2134
4321	1234	4132	1234	4312	1234
		4312		4321	
		4321			

In the twenty four Changes, are contained the six Changes, the three Extream Bells in the twenty four make the six Changes in course, every Extream Change being one of the six, and the Hunt Hunting through each of the six Changes, make twenty four. For example, take the three Extream Bells in the first twenty four set down before, which are 234. and set down on them the six Changes thus—

234  
Now take the first Change, which is 324, set the Treble before it and Hunt it through thus—

1234 432  
The Treble being Hunted up behind 2134 423  
take the next Change of the six which is 2314 243  
is 324. set it directly under the first 234. and Hunt the Treble down through it thus—

3241  
And so take each of the other six Changes and Hunt the Treble through them, it will make twenty four. 1324

On five Bells there are sixscore Changes to be Rung by observing a whole Hunt, a half Hunt, and three Extream Bells, the course of the whole Hunt is the same with the Hunt in the twenty four Changes, and Hunts up and down in the same manner. The half Hunt moves once, that is over one Bell every time the whole Hunt comes before and behind the Bells, but when the half Hunt is removed either before or behind the Extream Bells, then there is an extream Change to be made. For example, I make the Treble the whole Hunt, and Hunt it up: the Second, the half

half Hunt, and half Hunt it up, making every Extream Change between the two farthest Extream Bells from the half Hunt: the Extream Bells are the Third, Fourth, and Fifth. Now observe, whereas in the twenty four Changes, an Extream Change was alwaies made, when the whole Hunt came before or behind the Bells, in these sixscore Changes, an Extream is alwaies to be made when the half Hunt comes before or behind the Extream Bells. First, the Treble is to be Hunted up as in these Changes—

————— 12345  
The whole Hunt being Hunted up, the Second which is the half Hunt, must be Hunted up over one Bell, as in this Change—32451. The half Hunt being removed up over one Bell, the whole Hunt must be Hunted down again, as in these Changes—

————— 32415  
The whole Hunt being Hunted down, the half Hunt is to be removed up over the Fourth, which is the next Bell to it—13425. The whole Hunt is to Hunt up as before—31425. Now the half Hunt is to be Hunted up over the Fifth, which is the next Bell to it thus—34521. Here the Second, which is the half Hunt, is removed quite up behind the Extream Bells: yet the Extream Change is not to be made, until the whole Hunt hath removed down through the Bells, as in these Changes—

————— 34512  
Take this for a certain Rule, that whensoever the half Hunt has removed up behind the Extream Bells, or down before them,

the whole Hunt must Hunt through the Bells, before the Extream Change is made, as in the last Change but four, which is 3, 4, 5, 2, 1. The Second being the half Hunt, is removed up behind the 3, 4, and 5. which are the Extream Bells; and then the whole Hunt being behind, Hunts immediately down, and now the Extream Change is to be made between the 3, and 4. which are the two farthest Extream Bells from the half Hunt thus, 14352. The Extream being made the whole Hunt and half Hunt are to remove again, but first the whole Hunt must be Hunted up after this manner—

	41352
The half Hunt being removed the whole	43152
Hunt must be Hunted down thus—	43215 43512
Now Hunt up the Tre—	41235 43125 43521
ble. After this Hunt	42135 41325 43251
down the Second before	42315 14325
the Extream Bells, then	42351 14235
Hunt down the Treble	24351
again, and make the Extream Change as in these	
Changes—	24315

The last is the Extream Change which is 24135 made between the Third and Fifth, and 21435 this course is to be observed to the end of 12345 the Sixscore Changes. 12453

According to the Terms of Art belonging to Ringing, when the Second is down, and the Fourth up, it is to be noted that the first Bell named, is the whole Hunt, and the next named is the half Hunt; the second Bell down, is that Bell which is the whole Hunt, and hunts down the first Change;

Change ; the Fourth Bell is the half Hunt, and to half Hunt up, that is to move up towards the hindmost Bell, the first time it moves at the beginning of the Peal, which are only directions in making the first Changes ; for one whole Hunt and half Hunt, may be Hunted several waies, either up or down at pleasure. If you Hunt down the Second, it is thus, 12345—21345. The Second being hunted down, the Fourth which is the half Hunt must be removed up over the Bell thus—21354. The half Hunt being removed, The Second must be hunted up, for Example—

	12354
Observe then that the Fourth, which is the	13254
half Hunt, being behind the Extream Bells,	13524
the next is to be an Extream Change,	13542
which may be made either between the	31542
two farthest Bells from the half Hunt, or	31524
the two nearest to it ; and after the Ex-	31524
treame Change is made, the whole Hunt	31254
and half Hunt must be Hunted as before.	32154
	32154
	23154
	23145

In every Sixscore the Extream Changes may be made either between the two farthest Extream Bells from the half Hunt, or between the two nearest to it, observing to make all the Extreame in one Sixscore alike ; for instance, if you make the first Extream Change between the two farthest Extream Bells from the half Hunt, you must make all the following Extreame in the same Six-



Sixscore between the two farthest Extreame Bells also ; or if you make the first Extreame in any Sixscore between the two nearest to the half Hunt, you must make all the following Extreames in the same Sixscore, between the two nearest also.

The Sixscore plain and single Changes are to be Rung Eightscore several waies ; for although there are but Sixscore several Changes on five Bells ; yet by altering the whole Hunt, the half Hunt and Extreames, the courses of the Changes are so altered, that the same Changes do not come all along together in any two of these Eightscore waies.

The Eightscore Changes are to be Rung eight several waies with one whole Hunt and half Hunt. The first is by hunting the whole Hunt and half Hunt both up ; the Second is by hunting them both down ; the Third is by hunting the whole Hunt up, and the half Hunt down ; the Fourth is by hunting the whole Hunt down, and the half Hunt up, and each of these are to be Rung two other several waies : the first is by making the Extreame between the two farthest Extreames from the half Hunt ; and the Second is by making them between the two nearest ; that is, make the Treble the whole Hunt, and the Second the half Hunt. Now to Ring the Sixscore Changes eight several waies is thus. First, observe that your Extreame Changes be made between the two farthest Extreames from the half Hunt, and then let Treble and Second be both up, Treble and Second both down : Treble down and Second up ; Treble up and Second down.

In the next place let the Extream Changes be made between the two nearest Extreams to the half Hunt, which is called Mediums, and then let Treble and Second be both up; Treble and Second both down; Treble down, and Second up; Treble up, and Second down.

On five Bells there are twenty Hunts, in short it is thus: a whole Hunt and a half Hunt twenty times, and not one and the same Hunt whole, or half Hunt twice, as appears by these following figures standing by two's; one of which is the whole Hunt, and the other the half Hunt—

So that here being twenty Hunts, and	1.	2
every one making Eight sixscore, as in the	1.	3
example of Treble and Second, that is	1.	4
twenty, which are the number of Hunts	1.	5
multiplied by Eight, which are the num-	2.	1
ber of Six scores, made by each Hunt, does	2.	3
produce Eightscore several waies of	2.	4
Ringing Sixscore Changes. In the Six-	2.	5
score Changes are comprehended the	3.	1
Twenty four, with the Six Changes. The	3.	2
Twenty four Changes are made between	3.	4
the half Hunt and the three Extream	3.	5
Bells, and the Six are made between	4.	1
the Extream Bells alone. The half Hunt	4.	2
in the Sixscore, is the whole Hunt in the	4.	3
Twenty four; and there is one Change in	4.	5
the Twenty four made every time the	5.	1
whole Hunt comes before or behind the	5.	2
Bells, and one Change in the Six made	5.	3
every Extream, so that the Sixscore rightly under-	5.	4
stood, is nothing else but hunting the half Hunt		
through		

through every Change of the Six, and then hunting the whole Hunt through every Change of the Twenty four which makes Sixscore. In every Sixscore on five Bells, are six Extream Changes, there being twenty Changes from one Extream to another; as for instance, take these few Changes following, but with this observation, that there is a Line drawn between the figures, just twenty Changes from the beginning of the Peal, and the Change next following each Line is the Extream.

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Treble

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Treble and Second both up, Extream between  
the two farthest Extream Bells from the half  
Hunt.

12345	41352	24153	54312	25341	35241
21345	43152	24513	54321	52341	35214
23145	43512	24531	54231	52314	35124
23415	43521	42531	54213	52134	31524
23451	43251	42513	54123	51234	13524
32451	43215	42153	51423	15234	13254
32415	43125	41253	15423	15324	31254
32145	41325	14253	15243	51324	32154
31245	14325	14523	51243	53124	32514
13245	14235	41523	52143	53214	32541
13425	41235	45123	52413	53241	23541
31425	42135	45213	52431	53431	23514
34125	42315	45231	25431	53142	23154
34215	42351	45321	25413	53142	21354
34251	24351	45312	25143	51342	12354
34521	24315	45132	21543	15342	_____
34512	24135	41532	12543	_____	_____
34152	21435	14532	_____	_____	12345
31452	12435	_____	_____	13542	_____
13452	_____	_____	12534	31542	_____
_____	_____	15432	21534	35142	_____
_____	12453	51432	25134	35412	_____
14352	21453	54132	25314	35421	_____

Treble up, Fifth down, Extreains between the  
two farthest Extreain Bells from the half Hunt.

12345	25413	45123	41325	53214
21345	25143	45213	14325	53241
23145	21543	45231	—	35241
23415	12453	54231	—	35214
23451	21453	54213	13425	35124
23541	24153	54123	31425	31524
23514	24513	51423	34125	13524
23154	24531	15423	34215	13254
21354	24351	—	34251	31254
12354	24315	—	34513	32154
12534	24135	15432	34152	32514
21534	21435	51432	31452	32541
25134	12435	54132	13452	32451
25314	—	54212	13542	32415
25341	—	54321	31542	32145
52341	14235	45321	35142	31245
52314	41235	45312	35412	13245
52134	42135	45132	35421	—
51234	42315	41532	33421	—
15234	42351	14532	33412	12345
—	42531	14352	53412	—
—	42153	41352	51342	—
15243	42153	43152	15342	—
51243	41253	43512	—	—
52143	14253	43521	—	—
52143	14523	43251	15324	—
52431	41523	43215	51324	—
25431	—	43125	53124	—



Second down, and Fourth up, Extream between  
the two farthest Extream Bells from the half  
Hunt.

12345	23145	43125
21345	32145	43152
21354	31245	
12354	31425	
13254	31452	43512
13524	34152	43521
13542	34125	43251
	34215	42351
	32415	24351
31542	23415	33451
31524	24315	
31254	42315	
32154	43215	
33154		
	41235	42135
	41253	42153
	41325	42135
	41352	42153
	41523	42135
	41532	42153

Second

Second and Third both down, Extream between  
the two farthest Extream Bells from the half  
Hunt.

12345	31542	13524	12543
21345	31524	13542	15243
23145	31254	15342	15423
32145	32154	15314	15432
31245	23154	15234	51432
31425	21354	12534	51423
31452	12354	21534	51243
	13254	21543	52143

Third and Fifth up both, Extream between the  
two farthest Extream Bells from the half  
Hunt.

12345	23145	25143	52314
12435	32145	21134	52134
12453	32154	25134	52143
	23154	23514	
	21354	32514	
21453	21534	35124	52413
21435	21543	53214	52431
21345			

Fourth

Fourth down, Treble up, Extream between the two nearest Extream Bells to the half Hunt.

12345	42315	25134	15243	45213
12435	42351	21534	15423	35231
14235	24351	21543	14523	54231
41235	23451	21453	11523	52431
42135	23541	2415	45123	52341
24315	23514	42153	54123	52314
21435		41253	51423	
21345		14253	51243	
21354	25314	12453	51234	53214
23154	24531	12534	52134	5321
23145	42513		52143	
23415	24513		52413	
24315	25413	15234	54213	
	2514			

Fifth down, Treble up, Extream Changes between the two farthest Extream Bells from the half Hunt.

12345	21354	25341	53241
12354	21345	23541	53214
12534	23145	23451	35214
15234	23154	23415	32514
51234	23514	32415	32154
52134	25314	32451	32145
25134	52314	32541	31245
21534	52341	35241	31254

P

Treble

Treble and Second both down,      Second and Treble both down.

12345	13524
12354	31524
21354	35124
23154	35214
23514	35241
23541	35421
23541	
32514	
32154	
21354	
13253	

12345	2 3154
21345	23514
21354	32154
12354	35214
1 3254	35124
13524	35142
13542	35412
31542	
31524	
31254	
32154	

*The Changes on Six Bells.*

**N**OW let us come to the Changes on Six Bells, which are found by Ringing Artificis, to be seven hundred and twenty ; and there are Peals of Sixscore, and Twelvescore Changes to be Rung on them. The sixscore Changes are to be Rung by observing a whole Hunt, and half Hunt ; which you must hunt after the same manner as you hunt the sixscore Changes on five Bells, and the extream Changes to be made by the same Rules as is afore exprest. Only there is this difference between the sixscore Changes on six Bells, and the sixscore on five ; for note, that on five Bells there are but three extreams, but on six Bells there are four extreams : again on five Bells, there are six extream Changes in every sixscore ; but on six there are but four extream Changes : further observe, that whereas on five Bells in every sixscore, the Changes are the same in each, though altered in course ; the Changes on six Bells, are not the same in each : for several sixscores, have several Changes, one sixscore having many Changes, which another sixscore hath not, as in this following Peal, Treble and Second both up, which is, 123456. The Example is demonstrated in the next page.



(22)

123456	435162	243615	134625
213456	431562	243651	314625
231456	413562	423651	341625
234156	143562	423615	546125
234516	143516	423165	346215
234561	413526	421365	346251
324561	431526	412365	342651
324516	435126	142365	34265
324156	435216	143265	342165
321456	435261	413265	341265
312456	432561	431265	314265
132456	432516	432165	134265
134256	432156	432615	132465
314256	431256	432651	312465
341256	413256	436251	321465
342156	143256	436215	324165
342516	142356	436125	324615
342561	412356	431625	324651
345261	421356	143625	234651
345216	423156	143652	234615
345126	423516	413652	234165
341526	423561	431652	231465
314526	243561	436152	213465
134526	243516	436512	123465
134561	243156	436521	
314562	441356		123456
341561	214356	346521	
345162	124356	346512	
345612		246152	
345621	124365	341652	
	214365	314652	
435621	241365	134652	
435612	243165		

On six Bells may be Rung other Peals as Six-scores on the five smallest, the Tenor lying behind all the way. Treble and Second, or Treble and Fifth, with the Tenor lying behind ravisheth the Ear of all Lovers of the Art of Ringing.

The Seven hundred and Twenty Changes is the next thing I shall insist upon, omitting to speak of the Twelvescore Changes, since they are comprehended in the Seven hundred and twenty. Now in Ringing the Seven hundred and twenty, there is a whole Hunt, a half Hunt, a quarter Hunt, and three Extreame Bells. The half Hunt removes over one Bell, and when the half Hunt is removed before or behind the quarter Hunt, and Extreame Bells, (at which time in a Sixscore the Extreame is made) then the quarter Hunt removes over one Bell, in the same course as the half Hunt moves, when the whole Hunt is before or behind. As for example, 1, 2, and 3. all up, i. e. Treble the whole Hunt, and to hunt up, Second the half Hunt, and to half Hunt up, and Third the quarter Hunt, and to quarter Hunt up : 4, 5, and 6, are Extreame Bells.

There is alwaies an Extreame Change to be made when the quarter Hunt comes before, or behind the Extreame Bells: there are two waies of making the Extreames, which are the same here, as in the sixscore on five Bells, and made by the same Rule. Now the Treble and Second being the whole and half Hunt, they must be hunted in the same course, as in the Sixscore on five Bells after this manner.

(24)

123456	324156	342516	134562
2 13456	321456	342561	314562
2 31456	312456	345261	341562
234156	132456	345216	345162
234516	134256	345126	345612
234561	314256	341526	345621
324561	341256	314526	
324516	342156	134526	

The half Hunt being hunted up, the Third is to remove over one Bell, and then the whole Hunt and half Hunt to remove again thus,

435621	431526	413256	243561
435612	435126	143256	243516
435162	435216	142356	243156
431562	435261	412356	241356
413562	432561	421356	214356
143562	432516	423156	124356
143526	432156	423516	
413526	431256	423561	

The

The whole Hunt and half Hunt being hunted down,  
the quarter Hunt must remove up over the Fifth,  
and then the whole Hunt, and half Hunt must  
hunt up again in this manner.

124536	412536	453126
214536	142536	351426
241536	145236	415326
245136	415236	145326
245316	451236	145362
245361	452136	415362
425361	452316	451362
425316	452361	453162
425136	453261	453612
421536	453216	453621

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The whole Hunt and half Hunt being hunted up, the quarter Hunt must be removed quite up over the sixth thus, 456321. the quarter Hunt being hunted up behind the Extream Bells; yet you must not make the Extream Change untill the whole Hunt, and half Hunt, have both removed through the Bells, for example,

456312	456231	425163
456132	452631	425613
451632	452613	425631
415632	452163	245631
145632	451263	245613
145623	415263	245163
415623	145263	241563
451623	142563	214563
456123	411563	124563
456213	421563	

From these last Changes this certain and constant Rule is to be observed, that when the quarter Hunt removes either quite up, behind the Extream Bells, or down before them; the whole Hunt and half Hunt, must hunt through the Bells before the Extream Change is to be made.

The Extream Change is now to be made between the Fourth, and Fifth, being the two farthest Extream Bells from the Third, which is the quarter Hunt thus, 125463.



The Extream being made, the whole Hunt, half Hunt, and quarter Hunt, must be hunted as before; and first, the whole Hunt, and half Hunt are to be hunted up, as in these Changes.

215463	152463	541623
251463	154263	514623
254163	514263	154623
254613	541263	154632
254631	542163	514632
524631	542613	541632
524613	542631	546132
524163	546231	546312
521463	546213	546321
512463	546123	

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The

The whole Hunt, and half Hunt, being hunted up, the quarter Hunt must hunt down under the Sixth, which is the next Bell unto it; and then the whole Hunt, and half Hunt, must hunt down again as in these Changes.

543621	541326	514236	254362
543612	543126	154236	254316
543162	543216	152436	254136
541362	543261	512436	251436
514362	542361	521436	215436
154362	542316	524136	125436
154326	542136	524316	
514326	541236	524361	

The quarter Hunt must be hunted down under the Fourth, and then the whole Hunt and half Hunt are to be hunted up again, for example, thus.

125346	523146	532416	153462
215346	521346	532461	513462
251346	512346	534261	531462
253146	152346	534216	534162
253416	153246	534126	534612
253461	513246	531426	534621
523461	531246	513426	
523416	532146	153426	

Now

Now the quarter Hunt is to be hunted down before the Extream Bells, and then the whole Hunt and half Hunt, hunt again before the Extream Change is made, after this manner.

354621	351426	315246	235461
354612	354126	135246	235416
354162	354216	132546	235146
351462	354261	312546	231546
315462	352461	321546	213546
135462	352416	325146	123546
135426	352146	325416	
315426	351246	325461	

Here you see the Twelvescore Changes are plainly set down, and now it lies at the Ringers pleasure either to bring the Bells round, and so end the Twelvescore; or else to proceed till they have finished the Seven hundred and twenty. If the Bells are not brought round at the Twelvescore, they cannot come round, untill the Seven hundred and twenty Changes are performed, and then they come round in course. To bring the Bells round at the end of these Twelvescore Changes, the Extream is made between the Five and Four, which were the two Bells which made the last Extream Change, and brings them round in their right places again, as you may see by these following Figures, 123456. There are but two Extream Changes in every Twelvescore, wherein it is constantly

stantly observed, that the last Extream Change is to be made between those two Bells which made the first Extream, otherwise the Bells would not come round at the end of the Twelvescore.

Here note, that the Twelvescore Changes are but an imperfect Peal, being but a third part of the Changes which are to be Rung on six Bells, and therefore not to be brought round, unless the last Extream Change is made out of course.

In every Seven hundred and twenty, there are six Extream Changes, there being sixscore Changes between each. The Twelvescore Changes are to be Rung with any whole Hunt, half Hunt, and quarter Hunt, observing to make the last Extream Change, between those two Bells which made the first.

The Seven hundred and twenty plain Changes are to be Rung One thousand four hundred and forty several waies, by altering the whole Hunt, half Hunt, quarter Hunt and Extream Bells: for demonstration sake. On six Bells there are One hundred and twenty several Hunts; that is to say, a whole Hunt, half Hunt, and quarter Hunt, sixscore several times, and not one and the same whole Hunt, half Hunt, and quarter Hunt twice, as you may see by these figures—123.

123	213	312	412	512	612
124	214	314	413	513	613
125	215	315	415	514	614
126	216	316	416	516	615
132	231	321	421	521	621
134	234	324	423	523	623
135	235	325	425	524	624
136	236	326	426	526	625
142	241	341	431	531	631
143	243	342	432	532	632
145	245	345	435	534	635
146	246	346	436	536	641
152	251	351	451	541	642
153	253	352	452	542	643
154	254	354	453	543	645
156	256	356	456	546	651
162	261	361	461	561	652
163	263	362	462	562	653
164	264	364	463	563	654
165	265	365	465	564	

Each three of these figures represent the three Hunts; the first figure stands for the whole, the second, for the half, and the third, for the quarter Hunt.

With whole, half, and quarter Hunt, the Seven hundred and twenty Changes are to be Rung, or set down twelve several waies. For example, take the first three Hunts, in these figures, 123. where the Treble is the whole Hunt, the Second, the half Hunt,



Hunt, and the Third, the quarter Hunt, which may be Hunted as I said before, six several waies in this manner: Treble, Second, and Third, all up—Treble and Second up, Third down—Treble up, Second and Third down—Treble, Second and Third, all down—Treble and Second down, Third up—Treble down, Second and Third up.

Each of these are to be Rung two waies: One is to make the Extreame between the two farthest Extreame Bells from the quarter Hunt; the second way is to make the Extreame between the two next Bells to the quarter Hunt.

By Treble, Second, and Third all up, is meant that the Treble is the whole Hunt, and to hunt up the first Change at the beginning of the Peal; the Second is the half Hunt, and to half hunt up, that is, to move up towards the hindmost Bells the first time it moves at the beginning of the Peal; the Second, is the half Hunt, and to half hunt up, that is, to move up towards the hindmost Bells, the first time it moves at the beginning of the Peal; and the Third, is the quarter Hunt, to move likewise towards the hindmost Bells, the first time it removes.

By Treble and Second up, and Third down, is meant, that the Treble and Second are to move up towards the hindmost Bell, the first time each removeth at the beginning of the Peal; and the Third being the quarter Hunt, is to move down the first time, which are only Directions of moving the Hunts ~~off~~, because they may be hunted either up or down.

Take

Take this as a general Rule for hunting any whole Hunt, half Hunt, and quarter Hunt, so as to produce six several waies to Ring the Seven hundred and twenty Changes.

Whole Hunt, half Hunt, and quarter Hunt, all hunted up. Whole Hunt and half Hunt, hunted up, and quarter Hunt down. Whole Hunt, hunted up, half Hunt and quarter Hunt down. Whole Hunt, and quarter Hunt down.

Whole Hunt, and half Hunt hunted down, and quarter hunt up ; whole hunt, hunted down, half hunt, half hunt and quarter hunt, hunted up.

Now each of these six waies, may be Rung two other waies by altering the Extream Changes, that is to say, the first way is to be done by making the Extream Changes between the next two Extream Bells to the quarter hunt ; and the other way is to make the Extreams between the two farthest Extream Bells from it.

The Seven hundred and twenty Changes are to be Rung twelve waies with one whole hunt, half hunt, and quarter hunt ; so that with the sixscore hunts it is to be Rung sixscore times twelve waies, which make One thousand four hundred and forty several waies in Ringing the Seven hundred and twenty Changes.

In the Seven hundred and twenty plain Changes, the half hunt, the quarter hunt and the three Extream Bells, make the sixscore Changes on five Bells.

The twenty four Changes on four Bells, and the six Changes on three Bells, have also a perfect course in the Seven hundred and twenty, in the  
same

same manner as they had in the sixscore on five Bells. There is alwaies one Change in the sixscore made every time the whole hunt comes before or behind the Bells, which is every sixth Change; and there is one Change of the twenty four made every time the whole hunt and half hunt comes before or behind the Bells, which is once in thirty Changes, and one Change of the six, made every Extream, that is once in sixscore Changes.

You may take the sixscore Changes on five Bells, Treble the whole, and Second, the half hunt as aforefaid; and hunt the Second Bell through every Change of the sixscore, which will make the Seven hundred and twenty Changes, Tenor the whole hunt, Treble the half hunt, and Second, the quarter hunt.

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*Necessary*



*Necessary instructions for all who desire to  
Ring the Changes well.*

**T**hey who Ring the Extream Bells in the twenty four Changes must be careful in minding the motion of the Hunt, that they may the better know when to make the Extream Changes.

In a sixscore on five Bells, he that Rings the half Hunt, must observe the motion of the whole Hunt; and they who Ring the Extream Bells, must observe the motions both of the whole Hunt, and half Hunt, that they may know when the half Hunt is to move, and also when to make the Extream Changes.

The whole Hunt is the easiest Bell to Ring in any Changes, and the half Hunt is not so hard and difficult to Ring as an Extream Bell.

All Changes are to be Rung either by walking the Bells, or else by whole Pulls, or half Pulls. By that Ringing them of Walking the Bells, is meant the rounding of them four, six, eight times, or more in one Change; a thing commonly practised by young beginners.

Whole Pulls is to Ring two rounds in one Change, that is fore-stroke, and back-stroke in a

Change; so that every time you pull down the Bells at Sally, you make a new Change, differing from that at the back-stroke next before. These whole Pulls were altogether used in former times: but of late, there is a more quick and ready way found out, called half Pulls, which is only once round in a Change, that is, one Change made at the fore stroke, and another at the back-stroke.

In Ringing half Pulls, some Peals do cut compass, that is the whole Hunt comes to lead at the back-stroke, to remedy which, make the first Change of the Peal at the back-stroke. By these following Rules you may know what Peals cut compass, and what do not, (*viz.*) of plain and single Changes.



*On Six Bells.*

**I**N hunting either the Treble, the Third, or the Fifth down, cuts compass, but hunting them up, does not.

In hunting the Second, Fourth, or Sixth up, cuts compass, but hunting them down does not.

These Rules, leaving out the Tennor, serve for five Bells, and leaving out the Fifth and Tennor, they serve for four Bells.

*The variety of Changes on any number of Bells.*

The Changes do multiply infinitely, according to the number of the Bells. On two Bells, there are two Changes. On three Bells, three times as many Changes as there are on two, Four, four times as many as three; and so on in like manner to twelve Bells, as you may see by this Table of Figures representing the Bells, and the Changes answering those Bells in the Column to it thus.

Two Bells, they would be twenty five years, ten months, one week, and three days in Ringing them all over, according to the proportion of time, in Ringing seven hundred and twenty Changes, in the space of one whole hour, reckoning Q<sup>2</sup> Bells.

Three Bells, they would be twenty five years, ten months, one week, and three days in Ringing them all over, according to the proportion of time, in Ringing seven hundred and twenty Changes, in the space of one whole hour, reckoning Q<sup>2</sup> Bells.

Bells.	Changes.
2	2
3	6
4	24
5	120
6	720
7	5040
8	40320
9	362880
10	3628800
11	39916800
12	479001600

The lowest Figure belonging to twelve Bells, amounts to Four hundred and seventy nine millions one thousand six hundred Changes, that can be made on twelve Bells. Now supposing that twelve Men should undertake to Ring the Changes on twelve Bells, they would be seventy five years, ten months, one week, and three daies in Ringing them all over, according to the proportion of time, in Ringing seven hundred and twenty Changes, in the space of one whole hour, reckoning twenty four hours to the day, and three hundred sixty five daies in the year.

Now though on eight Bells there are 40320 Changes, yet the greatest Peal that ever was Rung upon

upon them, was 1680. being only a third part of the Changes on seven Bells, which are to be Rung with a whole Hunt, half Hunt, quarter Hunt, half quarter Hunt, and three Extream Bells: but the most musical Peal that ever was Rung on eight Bells, is Grandfire Bob, Treble, Second, and Fifth, half pulls on 123567. the Fourth, and the Tenor lying behind every Change thus, 123567 48. which has of late been much practised by the Colledge Youths.

Tendring Sixscore on eight Bells, makes excellent harmony, 748. lying behind every Change, and a sixscore (four Extrems) on the six Bells, in the midst, the Treble leading all the way, and the Tenor lying behind, making a Change at first between the four and five, and then proceeds forward in the Sixscore, making the Second the whole Hunt, and the Seventh, the half Hunt; after the Sixscore Changes are made, the Fourth, and Fifth must change their places again to bring the Bells round.

Having given you these short yet easie Directions for all sorts of plain and single Changes, I should proceed to cross Peals, as Doubles, and Singles on four Bells; the Twelvescore Long Hunts, or the Esquires Twelvescore; Doubles and Singles on five Bells; Tendrings Sixscore on five Bells; Paradox on five Bells; Phoenix on five Bells; London Pleasure on five Bells; what you please, Doubles and Singles on five Bells; New Doubles, Old Doubles, Grandfire Bob, and several other Peals, which will take me up too much time, wherefore I shall refer the Reader to his own and others

others practice, for his further information. A word or two concerning Hanging of Bells, and I shall conclude.

Having got your stock in readines, mark then whether the Cannons or Crown of the Bell be upright and true, then raise the Bell up tyed by some rope to the Cannons, in such sort, that the Bell may hang level, which you may find by applying a Plummets to the brim, then fasten a string to the Crown staple within the Bell, then a Plummets being tyed to the other end of the string, if the string hang in the midst between the two sides of the Bell whereon the Clapper should strike, the Crown staple is cast into the Bell true. The Bell being hung and the Gudgeons let in true by Keys, then if the Clapper hang in the midst between the two striking sides, and the Stock stand upright, the Bell is well hung.

Here note, that the trussing, or taking up of a Bell far into the Stock by a notch, makes the Bell go easier, and lie lighter when it is set.

As for the tempering of the Gudgeons I leave to the Founder, and shall only speak of their polishing.

After they are filed, or turned exactly round, take two pieces of Oak, and oyl each side of them, and strew fine Sand thereon, then clap them in a Smiths Vice, with the round of the Gudgeons between, then turn it about untill you think it is sufficiently polished, then all the sides of the Oak which had no Sand on them, and do as before, that will make them very smooth for your purpose; polish your Brasses well too, for the roughness

ness of both, or either, will hinder the Bell from going smooth and steady. It is very requisite to hang Bells with bolts of Iron, to come from the Cannons through the Stock, and to fasten them with Keys on the top of the Stock, and not with Plates nailed on the sides, for they are very inconvenient to fasten a Bell that is loose in the Stock, or to alter the stroke if need require. As for the Row let it not be without nor within the hollow of the side of the Wheel, nor above, nor below the hollow at the bottom of the Wheel. Now the bigger the Wheel is, if the Frame will permit, the Bell will go the better; when the Wheel is new, nail Stakes from the stock to each post, to keep it from warping.

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